Ollscoil na hÉireann, Corcaigh

National University of Ireland, Cork

Exploring Patients' Experience of Dental Implant Surgery with or without Intravenous Conscious Sedation: A Qualitative Study

Thesis presented by

Dr Sinéad O' Dwyer, BDS NUI, MFDS, Dip Con Sed, PG Cert (TLHE)

for the degree of

Doctor of Clinical Dentistry: Oral Surgery

University College Cork

Cork University Dental School and Hospital

Head of School/Department: Dr Christine McCreary

Supervisor: Dr Rícheal Ní Ríordáin

2021

Declaration

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Sinéad O'Dwyer

Abstract

Aim: Little qualitative evidence is available regarding the patients' experience of dental implant surgery and the influence of intravenous conscious sedation (IVCS) on the implant experience. The aim of this qualitative study was to explore patients' experience of dental implant surgery with or without IVCS, with specific consideration given to understanding the patients' preferences, motivations, needs and values.

Methods: Purposive sampling was used to recruit patients from the Dental Surgery Unit of Cork University Dental School and Hospital. A trained facilitator convened the individual in-depth semi-structured interviews over the telephone 7 days' post-surgery. Interviews were audio-recorded with a Dictaphone, manually transcribed and imported into a qualitative software tool (Nvivo). The data were then analysed using a thematic framework.

Results: Eighteen semi-structured telephone interviews were conducted; 8 patients had dental implants placed under IVCS, while 10 had dental implants placed with local anaesthetic (LA) only.

Thematic analysis revealed that emergent themes fitted appropriately with 3 different time points along the dental implant surgical journey (Pre-operative, Intra-operative and Post-operative experiences). Data and analysis were categorized, therefore, to follow the patients experience in chronological order. This facilitated narration of the patients accounts of the experience in an explicit way. Preoperative themes that emerged included the impact of tooth lost, motivations for seeking dental implants and dental anxiety. Intraoperative themes included confidence in the operating surgeon, local anaesthetic injections, the dental implant drill and being sedated. While post-operative themes that emerged were pain, postoperative instructions and follow up.

Conclusions: This research offers clinicians deeper understandings of the patients' experience of dental implant surgery, their preferences, motivations, needs and values, as well as the adjunctive effects of IVCS. Moreover, this research offers ways to improve clinical communications based on the patients' views and suggestions and ultimately enhancing the quality of patient care.

Acknowledgements

I would like to thank my research supervisor Dr Richeal Ni Ríordáin for her continued help, support and encouragement throughout the last three years. I feel privileged to have had her guidance and knowledge of qualitative research.

I would also like to express my thanks to Dr. Sarah Meaney, who gave up her valuable time to review my data and helped me brainstorm and understand qualitative themes. I am very appreciative for her guidance and expertise.

Thank you also to the kind patients who took time from their busy schedules to share their experiences with me, and without whom this project would not have been possible.

Finally, thank you to my friends and colleagues in the Cork University Dental School and Hospital, who helped me along the way and made the whole experience more enjoyable; and to my family and friends, who supported and encouraged me constantly.

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Chapter 1 Introduction

In the pursuit of addressing the concept of relevance, a quote from Albert Einstein: 'Not everything that can be counted counts and not everything that counts can be counted'. In the context of research, it is certainly an initial poignant idea when considering the subject of patient experience and the value of qualitative research, to explore this theme.

Patient experience is a much broader measure than an assessment of the provision of clinical care, encompassing the range of interactions that a patient has within a healthcare system. This includes their care from healthcare professionals to the quality of the healthcare service provided.

It is fundamental to understand patient experience as a key development in moving toward patient-centric care. Exploring the individual and distinct aspects of patient experience can lead to a better understanding of the extent in which patients are receiving care that is respectful and responsive to individual needs, preferences and values.

Increasingly evidence demonstrates that patient experience forms an integral part of measuring quality and safety in the health care service. A recent systematic review of international research reported consistent recognition of a positive association between patient experience and patient safety and clinical effectiveness. This was seen across a broad range of population groups, outcome measures, settings and disease areas. This study concluded that 'clinicians should resist side-lining patient experience as too subjective or mood-oriented, divorced from the 'real' clinical work of measuring safety and effectiveness' [(1)].

Patient experience differs from patient satisfaction in that to assess patient experience, one must find out from patients whether something that should happen in a healthcare setting actually did happen.

Patient satisfaction on the other hand is when a patients' expectations were met about a healthcare service. Therefore, if two patients, who receive the exact same care, have different expectations, their satisfaction levels naturally will be different [(2)]. It is nonetheless agreed that patient experience includes patient satisfaction, but that it goes beyond this to take account to the actual care experienced [(3)].

The importance of the patient experience has recently been acknowledged in the Irish context with the implementation of the National Patient Experience Survey which is committed to measuring and understanding the experiences of patients who access hospital care [(4)]. This survey is based on validated questions provided by the Picker Institute Europe which is an international charity working since 2000 across social and health care [(5)].

The Picker Institutes principles of patient centred care include the following eight domains:

1. Respect for patient-centred values, preferences and expressed needs, including cultural issues.
2. Co-ordination and integration of care across the health and social care system.
3. Information, communication and education on clinical status, progress, prognosis and processes of care in order to facilitate autonomy, self-care and health promotion.
4. Physical comfort including pain management.
5. Emotional support and alleviation of fear and anxiety about issues such as clinical status, prognosis and the impact of illness on patients, their families and finances.
6. Welcoming the involvement of family and friends

7. Transition and continuity as regards information that will help patients care for themselves away from the clinical setting
8. Access to care with attention to time waiting for appointments.

So how can we define and therefore measure patient experience? There are a variety of definitions incorporating the divergent views by different authors within the health care sector. For the purpose of this study I have chosen the following definition from the Beryl Institute: 'The sum of all interactions, shaped by an organisations culture, that influence patient perceptions, across the continuum of care' [(6)].

1.1 Dental implant treatment

Dental implants have become an increasingly popular option for the replacement of missing teeth, regarded as the gold standard in treating a variety of patients ranging from single tooth loss to complete oral rehabilitation. The increased interest in implant provision is related to a number of factors including; increased awareness of dental implants [(1)], the impact of tooth loss on patients' wellbeing [(7)], an increase in postgraduate training [(8)], improvements in implant technology leading to better treatment outcomes [(9)] and finally the growing demand of the ageing population [(10)].

Our societies' demographic is ever changing and therefore so must our consideration and approach to addressing patients' needs. The Central Statistics Office Ireland identified a 20% increase in those over 65 years within a 5 year period [(11)]. In 2017 a report by the Economic and Social Research Institute (ESRI) projected that by 2030 the population aged 80 or above would increase by between 89% and 94% [(12)].

According to the Irish Longitudinal Study on Ageing (TILDA), one in six Irish adults aged 54 years and over have no natural teeth with most wearing dentures. Not surprisingly, over a quarter of those experience difficulties with activities such as eating, smiling or speaking. Furthermore, this cohort of adults, report less active social participation, lower quality of life, increased depressive symptoms, and increased loneliness compared to adults with all their own teeth [13].

When addressing edentulousness one can consider traditional dental prostheses such as conventional complete dentures or implant retained prostheses such as overdentures. In a systematic review by Kutkut et al comparing conventional versus implant retained overdentures, the authors concluded that implant retained overdentures were associated with improved masticatory function, ability to speak, comfort and satisfaction [14].

The growing number of implants placed in Ireland reflects the evidence that patients request 'a more sophisticated' approach to the management of missing teeth, often times with higher expectations [15]. Along with the desire for more complex care they also wish to participate actively in the clinical decision-making. To allow for a more participative then they need to be better informed of the patients' experience of dental implant surgery.

The growing number of implants placed in Ireland is however accompanied by a concomitant rise in the number of patient complaints. This recent surge is due to unmet expectations and dissatisfaction with treatment outcomes.

Dental implants can be placed in either one-stage or two stage surgeries. Although a meta-analyses showed no statistically significant differences for prosthesis and implant failures between these surgeries, trends, especially in fully edentulous patients, favoured two-stage

(submerged) implants [16]. The two-stage approach is favoured in Cork University Dental School and Hospital.

There are of course deterrents from seeking and receiving dental implants. These include price implications, the invasive procedure itself and potential risks and complications. There is the additional consideration, that actually not every patient is suitable for dental implant surgery.

Patients who want to receive dental implants cannot avoid the insertion surgery. This surgical procedure is one of the most stressful and anxiety provoking procedures in dentistry [17]. In some circumstances, patients simply cannot tolerate this procedure under local anaesthetic alone and require intravenous conscious sedation.

1.2 Intravenous conscious sedation

Intravenous conscious sedation is a carefully controlled technique in which a single intravenous drug is used to reinforce hypnotic suggestion and reassurance in a way which allows dental treatment to be performed with minimal psychological stress. Verbal communication with the patient should be maintained at all times throughout the procedure and it is essential that the protective pharyngeal and laryngeal reflexes remain intact at all times. The technique must carry a margin of safety wide enough to render unintended loss of consciousness unlikely [18].

Intravenous conscious sedation is an effective method of reducing preoperative anxiety thereby encouraging patient cooperation for implant placement. Anterograde amnesia is a feature of IVCS, therefore once the first dose of Midazolam is given, the patient often fails to

remember the subsequent events. The patient will however remember everything up until that point, highlighting the importance of the preoperative timeframe.

1.3 Qualitative research methods

Quantitative methods alone do not answer every question! Qualitative research therefore aims to assist our understanding of what it is like to be the patient, challenge the current assertions and encourage us as clinicians to truly engage with our patients in our pursuit for best practice. Fundamentally it aims to delve down beneath the superficial and examine what is really going on.

Qualitative research explores the beliefs, expectations and understandings of patients which can by extension then influence health care decisions, hopefully creating a continuous improvement environment. Meaningful engagement activity and qualitative research can complement quantitative data in supporting deeper exploration of the meaning of the information provided, allowing respondents to report thematically in a rich context using their own words. Respondents are free to ponder and answer in their own style through an open dialogue mechanism with their thoughts not impeded or curtailed to closed questioning.

Good quality qualitative research is capable of addressing other aspects of dental implant surgery using the lens of patients' perspectives, experiences and expectations. In the broader sense, this helps to give clinicians vital insight into the patients' attitudes and behaviour and a clearer understanding of treatment choices and resultant outcomes. Patient feedback not only enables a choice between considering alternatives in health care but it is also useful in assessing the process of consultations and patterns of communication.

Such information will aid clinicians to understand patients experience and in turn enhance the quality of patient care. Furthermore, the views and experience gathered in this study could assist clinicians to strengthen patient-dentist communication, better understand the general public's perspective and contribute to the creation of positive clinical experiences in implant dentistry.

Parts of this research have been published in a peer reviewed journal, the Irish Journal of Medical Science (Appendix 9) and presented at a national conference, the International Association of Dental Research (Appendix 10).

Chapter 2 Literature review

The literature review will be organised and summarised under the following four sections

2.1 A qualitative synthesis of studies relating to patients' experience of dental implant surgery

2.2 An overview of the quantitative research relating to patient outcomes in implant dentistry

2.3 Dental anxiety

2.4 Conscious sedation

2.5 Conclusion

2.1 A qualitative synthesis of key studies relating to patients' experience of dental implant surgery

2.1.1 Background

In recent years, qualitative research studies have contributed positively to various aspects of patients' healthcare in medicine and dentistry (19-21). These studies have highlighted the need for better education and support for patients at various stages of treatment, be that a medical or surgical intervention. They have identified key issues from receiving insufficient, confusing and generally untimely information, which can lead to high levels of anxiety and depression and an inability to cope with the challenges after surgery. Furthermore, they have encouraged the need for further research into how patients' experiences influence their decision about surgery and its outcomes.

This part of the literature review aims to summarise the findings of published qualitative studies relating to patients' experiences of implant treatment at the surgical stage of the treatment pathway.

2.1.2 What is qualitative research synthesis?

Traditionally, systematic reviews of randomized controlled trials (RCTs) have formed the scientific basis of health care interventions. Consequently, the value of an intervention is determined primarily by effectiveness and not by the patient's opinion as to whether an intervention should and can be used.

Despite the enormous potential that qualitative evidence has on influencing patient-centred care, it does not play the deserved significant role in the evidence-based movement. The exclusion of qualitative studies from systematic reviews is the culprit for this deficiency. In order to address this bias, qualitative researchers have suggested combining qualitative studies in a review to draw on the broader range of participants and descriptions [(22)]. Consolidating the body of knowledge on a particular topic will in turn enhance the significance of its findings. This is called qualitative research synthesis.

The goal of qualitative synthesis seeks to create understanding or interpretive explanations of a phenomenon [(23)]. It makes connections between existing studies and helps to identify gaps and omissions in a given body of research. It also involves multiple stages of searching, extracting and summarising published qualitative data from original research relevant to the same topic [(24)].

2.1.3 Search strategy, qualitative data extraction and synthesis

A comprehensive literature search of the following databases: PubMed, Scopus, Web of Science, PsycINFO, Google Scholar, and Cochrane, was carried out in April 2019 and updated in January 2020.

The search strategy for patient experience of dental implant surgery used the following MeSH terms and text words with the application of Boolean Logic: ((((((dental implant*) OR (dental implant surgery)) OR (dental implant prosth*)) OR (implant crown) AND (qualitative research

methods)) OR (qualitative data analysis)) AND (patient experience*)) OR (patient based outcome*)

The search was limited to 'human', 'dentistry' and 'English language'.

A manual search was also carried out on the following journal titles, which were deemed especially relevant to the research topic:

- Clinical Oral Implants Research
- The International Journal of Oral and Maxillofacial Implants
- Journal of Dentistry
- British Dental Journal
- Journal of the Irish Dental Association

The second stage was then performed extracting the citations and reference list of all relevant articles to reveal any further relevant studies.

Studies were included if they used qualitative research methods and were published in English. Furthermore, they had to explicitly consider the surgical aspects of patients experiences of dental implants. Studies which did not consider the surgical aspects of dental implant treatment, or did not use wholly qualitative research methods, were excluded.

The studies included for the qualitative synthesis were assessed for quality using the CASP checklist (25), however some studies will remain difficult to appraise and will rely largely on subjective judgement (26).

The analysis of included studies looked at categories for data extraction, which were identified and tabulated to compare across studies. Such categories included the type of implant restoration, the stage of the implant journey the patient was interviewed at, the

method of data generation and the method of qualitative analysis. The authors themes were identified, extracted and compared across studies. Lastly subthemes were highlighted which recognised commonalities across studies and any potential gaps in the literature.

2.1.4 Literature search outcomes

The two-stage search retrieved a total of 1442 papers. These were transferred to EndNote citation manager and duplicates were removed leaving 817 articles.

Title and abstract screening of 817 papers identified 45 articles that used qualitative methods to consider patients' experiences of dental treatment.

Of these 45 articles, 15 articles considered patients' experience of dental implant treatment of which 5 recruited patients at the intra-operative surgical implant stage, as shown by the PRISMA flow diagram (Fig. 1).

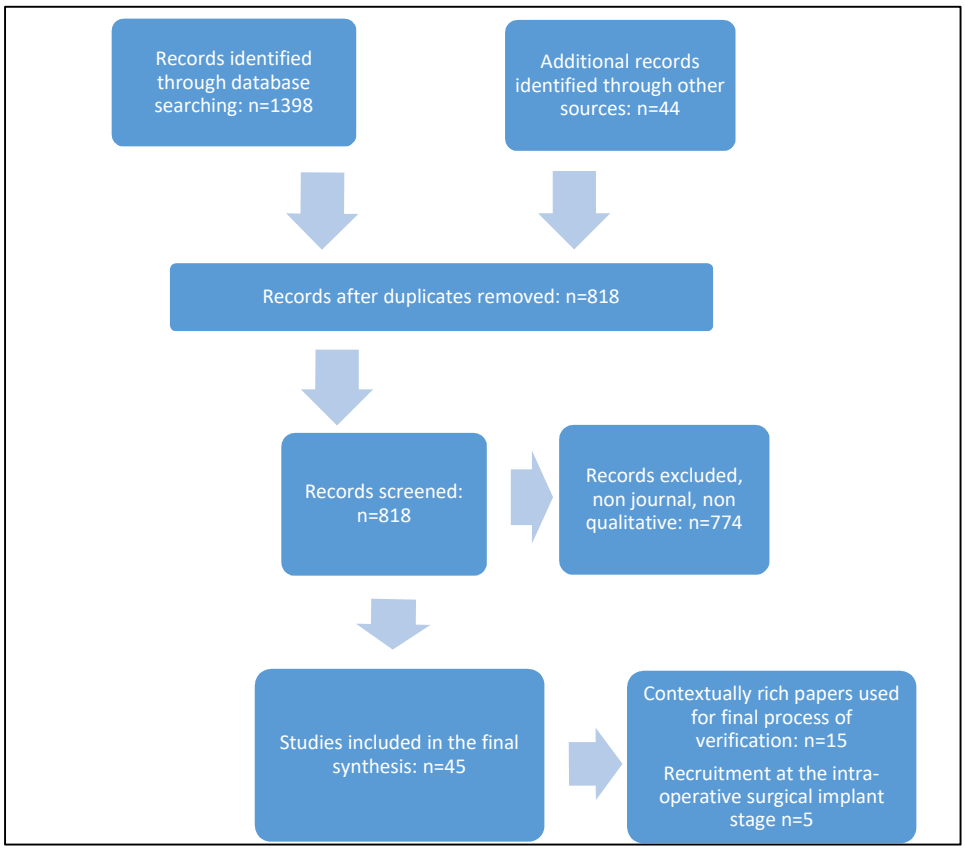


Figure 1: PRISMA flow diagram

Table 1 : Included qualitative studies concerning patients' experiences of dental implant treatment

Citation	Country	Patient demographics	Stage of treatment at which interviews took place	Data generation and analysis methods
Nogueria et al. (2018)(29)	Brazil	13 patients, M=4, F=9, Age=54-71yrs	1 yr. post single implant mandibular overdenture	3 focus groups, Thematic analysis
Kashbour et al.(2016)(30)	United Kingdom	34 patients, M=15, F=19, Age=16-76yrs	Different stages if implant treatment	38 telephone and face to face interviews, Thematic analysis
Abrahamsson et al. (2016)(31)	Sweden	15 patients, M=5, F=10, Age=27-87yrs	Post-implant treatment suffering from peri-implantitis	Open ended interviews, Grounded theory
Wang et al. (2015)(7)	Hong Kong	28 patients, M=10, F=18, Age=35-64yrs	No involvement with implant treatment	6 focus groups, Grounded theory
Atieh et al. (2015)(32)	New-Zealand	15 patients, M=6, F=9, Age=36-77yrs	Post-implant treatment	Interviews, inductive and content analysis
Exley et al. (2012)(33)	United Kingdom	27 patients, M:F ratio unclear, Age=23-84yrs	Decision making stage of implant treatment	Interviews, Thematic analysis
Rousseau et al. (2014)(34)	United Kingdom	39 patients, M=16, F=23, Age=23-84yrs	Treatment or post-implant treatment stage	Semi-structured interviews, Thematic analysis
Grey et al. (2013)(35)	United Kingdom	9 patients, M=3, F=6, Age=49-69yrs	Treatment or post-implant treatment stage	Telephone interviews, Thematic analysis
Lantto and Wardh (2013)(36)	Sweden	17 patients, M=7, F=10, Age=33-87yrs	Post-implant treatment stage	Interviews, Grounded theory
Osman et al. (2012)(37)	New-Zealand	16 patients, M=13, F=3, Age=46-80yrs	6 months post-implant treatment stage	In-depth interviews, Grounded theory
Narby et al. (2012)(38)	Sweden	10 patients, M=4, F=6, Age=54-84yrs	Post-implant treatment stage	Interviews, Grounded theory
Johannsen et al. (2012)(39)	Sweden	17 patients, M=8, F=9, Age=46-81yrs	3 yrs. post-implant treatment stage	In-depth interviews, Thematic analysis
Ellis et al. (2011)(40)	United Kingdom/Canada	30 patients, M=13, F=17, Age=55-88yrs	Refused to have a dental implant	5 focus groups, Thematic analysis
Hyland et al. (2009)(41)	United Kingdom	33 patients, M:F ratio unclear, Age=48-84yrs	Pre and post-implant treatment stage	Semi-structured interviews, Thematic analysis
Trulsson et al. (2002)(42)	Sweden	18 patients, M=8, F=10, Age=58-86yrs	Post treatment with an implant retained denture	Interviews, Grounded theory

Table 1 summarises the studies in scope for this literature review. The vast majority of the studies were conducted in the post implant stage with only two studies looking at the surgical treatment stage specifically [27, 28]. A study produced by Johannsen et al. looked three years retrospectively after having an implant placed [29]. Conversely in the research by Wang et al. they interviewed members of the public who had no dental implant experience yet, but sought to evaluate their information acquisition and perception of dental implants [30]. A 2016 paper by Abrahamsson et al. considered patients' experiences of dental implant complications, exploring their reactions on being diagnosed with such complications which unexpectedly may arise [31].

Ten of these studies based the 'implant experience' on retrospective accounts of patients either at the end of their treatment or after a period of using the implant retained restoration, be it a crown or a denture, with the main focus being implant restoration outcomes.

Only five studies recruited patients at the intra-operative surgical implant stage [27, 28, 32-34] and of these five studies, surprisingly only two studies completed by Nogueria et al. and Kashbour et al. aimed to explore patients' thoughts, feelings about and experience of implant surgery specifically [27, 28]. These were also the two most recent studies, completed in 2018 and 2016 respectively.

Demographically there was representation of both sexes throughout the research with a 23-86-year age range. It is of noteworthy mention that the focus of studies was primarily on the denture wearing population and their experience of implant retained dentures. Unfortunately, some of the studies failed to report on the extent of tooth loss [29, 33, 35, 36], which is, for obvious reasons, fundamental to their experience and an obvious limitation in the context of potentially understanding motivations.

Data generation consisted primarily of one to one interviews, three of the studies had focus groups [28, 30, 37] and a further two studies undertook telephone interviews [27, 32].

The preferred methods of qualitative analysis consisted of 10 studies undertaking thematic analysis [27-30, 32-34, 36-38] and 4 studies undertaking constant comparative methods of grounded theory [31, 35, 39-41].

In order to group common themes together across all studies it is necessary to subdivide the intra-operative surgical phase into

- Pre-surgical anticipations
- The actual surgical experience-intraoperative treatment stage
- The healing phase

Pre-surgical anticipations

The contemporary study by Kashbour et al. suggests patients' identified that they had overestimated the amount of pain they would experience during surgery leading to pre-surgical anxiety(27)(27). In order to quell this anxiety, they tended to avoid obtaining information about the surgical procedure, bestowing their trust upon the clinician instead [27].

> *'I didn't want to know about the surgery, what happened and how the implants came about to eventually go into your mouth may be because I trusted them 100%. I could put my complete trust in them* (the clinicians)'

Interestingly, when questioned about the amount of pre-surgical information they had received, in a way that they could assimilate, patients in the review by Atieh et al. felt that an explanation from the clinician was preferable (and exceeded) that contained on an

information leaflet [36] '*I had information given to me to read, um, probably more face to face may have been easier'*.

Patients also questioned their fitness to tolerate the surgery and inquired about its appropriateness as cited in Ellis et Al '*Your bones are already brittle, because you are older, and you have a hole (from the implant insertion). It's like planting a nail in a dry board: it can split in two, it can break'* [37].

The majority of patients in the study carried out by Kashbour et al. believed that the benefits of achieving the goal of improving form and function, far outweighed any pain or discomfort suffered [27].

> '*If I have to go through some pain, I'll go through any pain whatsoever, right, to have, to be normal again, it doesn't frighten me the pain and surgery, and that, it's a means to and end*'

In a study conducted in Brazil by Nogueria et al. most patients felt that the costs involved were extortionate and a major deterrent from having treatment [28]. *'I thought I could never have something like a dental implant. I thought it was something available for rich people only'.*

Poignantly, with the exception of Brazil, all other studies were carried out in countries of the developed world.

When finances were not considered the primary issue, a non-descript apprehension of the unknown and a conviction that implant surgery would be painful remained a common theme as highlighted by Atieh et al [36].

'*I don't want it* (implant*), they could give it to me free and I'd still refuse, I'm too afraid of suffering. I've had enough suffering. To start with I have a very low tolerance level for pain, thank you very much. So I would worry about the pain caused by implantation'*

The actual surgical experience-intraoperative treatment stage

Of the literature in scope, the majority of researchers examined and concluded that patients felt that, whilst they were knowledgeable about the surgery, they potentially over-estimated the difficulty of the surgery and the severity of pain experienced, which they attributed to the skills of the clinician as per a respondent in Atieh et al [(36)].

'*I thought it was a lot better than going to the normal dentist, I thought that there was a lot of care involved, it's like, I suppose like having a baby, you know you're going to have it and its fine but when you're actually having it you think I don't want this'*

This is corroborated in the paper completed by Kashbour et al. concluding that most patients overestimated the amount of pain associated with the dental implant surgery '*Oh, I think I overestimated the surgery. Definitely a lot easier than what you would think it was'*

[(27)].

Conversely, in a study undertaken by Osman et al. they indicated that, for some patients, the dental surgery can cause more physical trauma that anticipated [(40)].

'Oh well, the surgery was quite um; yeah I think possibly, it was a bit more dramatic than I thought. Yeah I think I didn't quite realise exactly the amount of surgery that was involved, I just thought you know that they would make a small incision and plonk it in. I didn't expect them to open, yeah I didn't expect quite some major surgery and it was a wee bit of a shock'

In most of the cases examined by Nogueria et al. pain during the surgery didn't appear to be an issue at all *'Well, I thought it was a painful procedure. And then I was really surprised, because there's no pain. It's pain- less…I felt nothing! All of a sudden, the surgery was almost over... I don't know if it was because I wanted so badly to get my mouth fixed that honestly I felt nothing'* [28].

Patients who chose to be sedated for the implant surgery considered this beneficial, necessary and a considerable advantage [27].

> *'I had the sedation, just in the back of the hand, it wasn't like a (general) anaesthetic. I'm not sure what it was, what they use, but it was great; I loved it. It was a good time, I can't really remember the surgery itself, which is great, no pain, no trouble. But I was very relaxed it went actually very quickly'*

The healing phase

Post-operatively, many patients realised that they had underestimated the morbidity associated with this aspect of surgery. They tended to focus on the actual surgery and not on what would happen after the surgery was complete as illustrated by two respondents in Kashbour et al. [27].

> '*I expected it to be painful having it done but as it turned out it was a lot more painful afterwards'*

> *'I couldn't believe the pain about an hour later. I, it was very very extreme in the jaw bone, you know. I called into the pharmacist for some painkillers and they didn't work anyways. But eventually it settled down and my implants have been very successful'*

On the contrary some patients considered that they had overestimated the negative aspects of the post-operative period and were positively surprised when they experienced a painless period, rapid healing and an absence of complications. They smoothly returned to their usual habits including eating normally immediately after surgery.

> *'I had no pain nor inflammation. No problem at all. Everything was normal. Many people complained about pain and so on but I didn't have that. After surgery, I got home and had my usual meal: rice and beans… I've never had any problems ever since. Thank goodness'*

Corroborating this perspective, Atieh et al. considered the cohorts' experiences of one implant placement and healing as generally positive [(36)].

> *'I was absolutely impressed. I thought gee it is like being in a hospital really, you know it was high-tech, very professional. The staff on the day, the doctors and the colleagues who assisted in the surgery and even the nurses in the surgery you know they put me at ease, there was no discomfort… I was as numb as anything, there was no pain, I could see all the blood happening and things and going, this is fantastic I can't feel a thing…'*

Equally Nogueria et al. revealed that the post-surgical recovery exceeded the pre surgical negative expectations [(28)].

> *'I thought it would take longer to heal, to get better and be free of pain. In the beginning, I felt some pain, of course, but it didn't last. My body took it very well. I didn't have any problem or anything unusual. I thought it would be more complicated. I thought the pain would last longer'*

Discussion

Dental implants can be placed in either one-stage or two stage surgeries. The first phase involves the surgical procedure of implant placement into the jaw, and the second phase involves exposing the implant and placing the final abutment. These procedures are usually undertaken by an oral surgeon or a dentist who has further training in implant surgery. Although a meta-analyses showed no statistically significant differences for prosthesis and implant failures between these surgeries, trends, especially in fully edentulous patients, favoured two-stage (submerged) implants [(16)]. The two-stage approach is favoured in Cork University Dental School and Hospital.

Once the surgery is complete, the implant is then restored with a prosthesis namely a crown or a denture. To examine how the literature addresses the patients experience of dental implant treatment at various stages, it is prudent to divide the pathway into pre-implant stage, intra operative implant surgery or treatment stage and post-implant stage with a prosthesis. In an effort to group common themes from this review, the surgery or treatment stage was further subdivided into pre-surgical anticipations, the actual surgical experience and the healing phase.

The rationale for the wide range of responses (when considering the surgical experience) could be attributed to a number of factors. These include the patient themselves and their co-morbidities or pain thresholds, the number and position of the implants being placed, the level of anaesthesia or sedation used and indubitably the operators' skill and experience.

Barriers for treatment included a lack of information, comorbidities, previous unpleasant dental experience, distrust in the clinician, older age, cost and fear [27, 28, 37]. Dental anxiety, was unsurprisingly a major deterrent as explored in the respective research conducted by Narby et al. and Lalabonova et al. [41, 42] .

Motivators for treatment included determination to improve aesthetics, function and their social life [27]. Additional motivating factors included a sense of opportunity to reverse time and a dissatisfaction with their current state [28].

No study mentioned any bone grafting procedures with only Abrahamsson review highlighting the experience of the dental implant complication of peri-implantitis [31]. One study suggested that the reason for this could be down to the challenges and discomfort that patients can be experiencing during this period [40]. There was also a complete lack of emphasis on the importance of maintenance of dental implants.

Furthermore, most studies focused on implant retained dentures with very few looking at single implant crowns. It is not surprising therefore, that in conjunction with this there was a deficit in information about the experiences of younger patient groups.

The majority of studies were retrospective with patients having finished their implant treatment. Very few studies interviewed patients in active treatment at the time of interview. This may have reduced the possibility of obtaining in-depth information due to the pitfalls associated with memory recall. The benefits of contemporaneous interviewing would eliminate the bias that may be imposed when the patient is finished treatment compared to how they perceived earlier treatment stages.

A substantial finding from this qualitative synthesis was the overwhelming lack of reporting on patients' experiences of receiving dental implants under conscious sedation. It is difficult to advocate for the use of conscious sedation when there is little to no research on the patients' experience of it. The one study that did enquire about the experience of sedation felt that it was extremely necessary, beneficial and something they would highly recommend. They felt that the sedation helped them overcome their anxiety and managed this throughout the entire length of the procedure [27].

2.1.5 Conclusion

The studies included in this textual narrative synthesis provide insight into patients' experiences of dental implants, spanning the therapeutic timeline. They looked at the experience of tooth loss, the pre-implant experience, motivating factors and barriers for treatment and post-implant experience with the prosthesis. Future work should focus on the identified gaps in the research knowledge namely investigating the intraoperative surgical experience and the effects that conscious sedation has on this experience.

The aforementioned studies give considerable insight into patients' experiences of dental implants in general. They looked at the experience of tooth loss, the pre-implant experience, motivating factors and barriers for treatment and post-implant experience with the prosthesis.

However, apart from two studies, there is very little mention of the experience of the actual dental implant surgery. Furthermore, most studies focused on implant retained dentures with very few looking at single implant crowns. It is not surprising, therefore, that in conjunction with this there was a shortage of information about the experiences of younger patient

groups. The majority of studies were retrospective with patients having finished their implant treatment. Very few studies interviewed patients in treatment at the time of interview.

The most substantial finding from this synthesis of key qualitative studies was the overwhelming lack of reporting on patients' experiences of receiving dental implants under conscious sedation. It is difficult to advocate for the use of conscious sedation when there is little to no research on the patients' experience of it. It is therefore paramount that future work must focus on filling the void in this part of the literature.

The included studies undoubtedly give considerable insight into patients' experiences of the dental implant journey, which in the main, had overall positive consensus. However, truly embedding the learning from studies will be key to ensuring that a continuous improvement cycle will be maintained.

Barriers to treatment included lack of information, comorbidities, previous unpleasant dental experience, distrust in the clinician, older age, cost and fear [27, 28, 37]. Dental anxiety, which will be discussed in more detail later on, was unsurprisingly a major deterrent [41, 42] Motivators for treatment included determination to improve aesthetics, function and their social life [27]. Additional motivating factors included a sense of opportunity to reverse time and a dissatisfaction with their current state [28].

The majority of interviews were retrospective. This may have reduced the possibility of obtaining in-depth information due to the pitfalls associated with memory recall. The benefits of contemporaneous interviewing to gather data therefore is paramount to ensure against this pitfall.

2.2 An overview of the quantitative research relating to patient outcomes in implant dentistry

As qualitative research seeks to enhance quantitative research, it is prudent to select some key papers from the abundance of quantitative research undertaken in implant dentistry. These papers were manually selected from the eliminated cohort during my qualitative synthesis, due to their quantitative nature.

This section of the literature review will focus on patient reported outcomes including patient satisfaction, expectations and quality of life changes in relation to dental implants.

2.2.1 Patient reported outcome measures

Patient reported outcome measures (PROMs) are defined as 'reports that come directly from patients about how they function or feel in relation to a health condition and its therapy, without interpretation by a physician or anyone else' [(43)].

PROMs have been identified as an invaluable source of information, which can be used to keep treatment goals patient-centred and ultimately improve services. They have superseded the traditional methods of measuring outcomes based on objective measures that were usually clinician led. This is due to the fact that what a clinician and a patient prioritise as important may be fundamentally different.

The majority of PROMs have been collected through patient based questionnaires and visual analogue scales (VAS). The latter was used to record the patients' expectation pre implant treatment and the patients' satisfaction post implant treatment.

VAS was originally designed to evaluate pain and has become a standard in pain research as cited in "Measurement of pain" by Huskisson et al. [(44)]. The advantage of the VAS is its easy use and applicability by the patients. Compared with categorized questions, the VAS is advantageous in its simplicity of statistical analysis, elimination of language barriers and the

ease of comparison of results from other studies. Operationally a VAS is usually a horizontal line, 100 mm in length, anchored by word descriptors at each end, for example very satisfied-not satisfied. The patient marks on the line the point that they feel represents their perception of their current state. The VAS score is determined by measuring in millimetres from the left-hand end of the line to the point that the patient marks.

2.2.2 Patient satisfaction

When determining patients' satisfaction with dental implant treatment it appears that a number of factors such as patient expectations and knowledge form major determinants in assessing their approval of the treatment[45]. In addition personality traits are another overwhelming predictor of patient satisfaction [46]. Positive personality predictors include openness, agreeableness and consciousness whereas neuroticism was found to be a major negative predictor. Studies seem to indicate that patients who receive a fixed overdenture are less satisfied that those who receive a fixed prosthesis [45]. In general however, especially for edentulous patients, there is an improvement in patients satisfaction after treatment with implant supported prosthesis [10, 47].

In a paper exploring the relationship between pre-operative patient anxiety and postoperative patient satisfaction (in dental implant surgery with intravenous conscious sedation) it was determined that preoperative patient anxiety was associated with lower post-operative satisfaction [48]. Furthermore, anxiety was higher in younger patients and in women. The female predilection reinforces an observation substantiated in previous studies [49, 50]. The role of anxiety specifically and its relationship to patient experience and satisfaction of dental implant surgery will be discussed in section 2.3 of this literature review.

2.2.3 Patients expectations

When it comes to patients expectations of dental implants, there is no doubt that it is perceived to be high [51] and in some cases actually unrealistic [52]. A recent systematic review by Yao et al, concluded that patients had high expectations in relation to dental implant outcomes regardless of the extent of tooth loss or the type of implant retained restoration [52]. A 34-item questionnaire was developed consisting of statements to investigate patients' preoperative information, perceptions and expectations from treatment with Dental Implants. These statements were followed by a continuous visual analog scale (VAS) and patients were asked to place a mark on the line indicating the extent of agreement or disagreement with the respective statement. Expectations from treatment outcome were commonly high, while there was a significant correlation between the overall mean of perception scores and outcome expectation scores ($r = 0.32$, $P < 0.001$). Overall, younger subjects (<45 years) and those with higher education level (bachelor and postgraduate) tended to present more realistic perceptions and lower outcome expectations. Another study completed by Allen, McMillan & Walshaw looked at two groups of edentulous patients receiving either conventional dentures or implant retained dentures and the latter's expectations were exceedingly higher [51].

Moreover, it appears to be a common misconception that dental implants will last longer than natural teeth [52]. This is echoed in numerous quantitative studies carried out over the past decade [53-56], where a lack of education and/or misinformation are the major drivers in this falsehood. The source of such misinformation could be assumed to be media campaigning from the implant companies themselves.

When a patient invests their time and (often considerable) amount money into something, it is unsurprising that it comes with high expectations. This highlights the necessity for carefully

assessment and management of patients' expectations prior to treatment commencement and an additional requirement to address any misinformation with clarity.

2.2.4 Oral health related quality of life

Oral health related quality of life (OHRQoL) is a multifaceted umbrella term that encompasses the subjective evaluation of an individual's oral health, functional well-being, emotional well-being, expectations and satisfaction with care and sense of self as per Sischo & Broder study in 2011 [57]. It originated from the concept that clinical measures of health will no longer suffice and need to be supplemented by the patient's own experience and concerns. Furthermore, it reflects the fact that the aim in medicine or dentistry is not just to prolong life or indeed the longevity of the dentition, and render them disease free, but to positively influence the emotional, social and physical well-being of the patient. Figure 2 displays the theoretical model for oral health related quality of life, which includes a conglomerate of the individuals' characteristics, biological and genetic makeup and environment: all of which affects the persons' oral health. The model is applicable to both adults and children, for children, caregivers' characteristics are also included, as indicated by the asterisk, as they also affect the children's oral health related quality of life (Fig. 2).

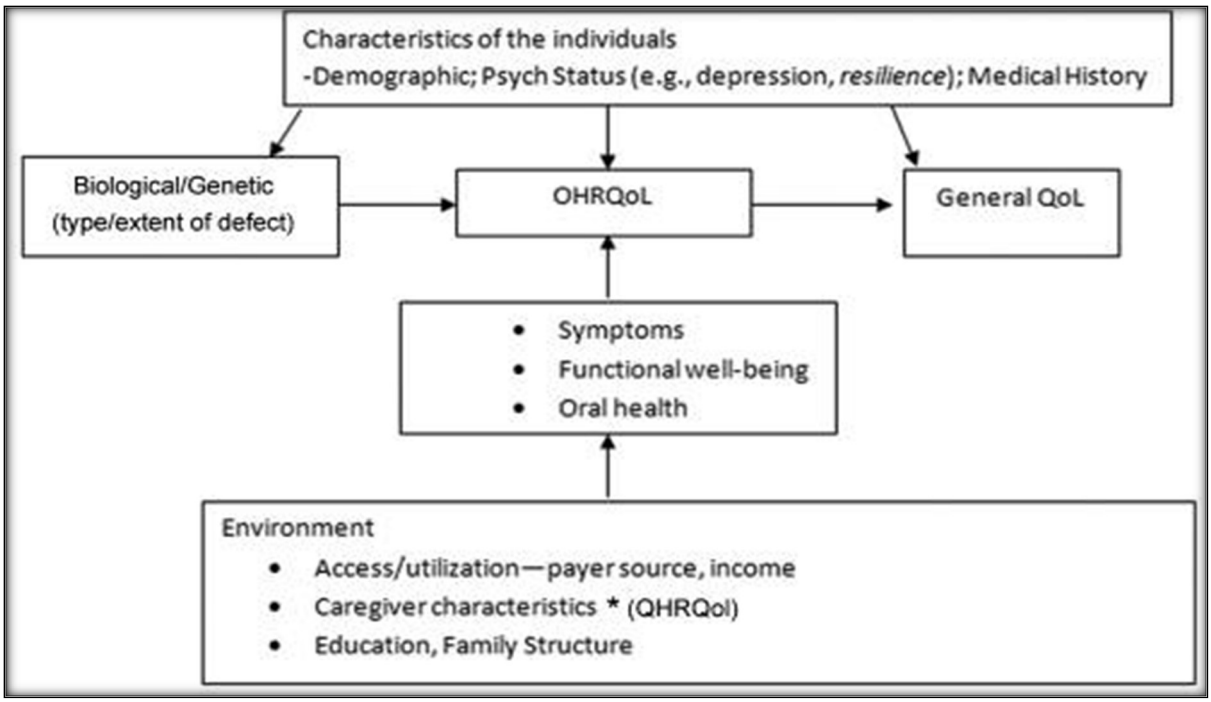


Figure 2 : Theoretical model for OHRQoL (57) *Applicable for children only

A systematic review and meta-analysis conducted in 2010 provides strong evidence that tooth loss is associated with impairment of OHRQoL and location and distribution of tooth loss affect the severity of this impairment [58]. Numerous cross-sectional studies have confirmed the positive contribution that dental implants have brought to a patients' quality of life by improving their oral health [59-61]. Because the studies have not been longitudinal however, there has to be an assumption that these positive contributions continued.

Tools used to assess OHRQoL include questionnaires, the most frequent one being the Oral Health Impact Profile (OHIP-49). This is a validated and reliable instrument used for measuring the impact that oral disease conditions have on a patient's life [62]. It was developed in an older population, first proposed by proposed by Slade and Spencer [62] based on Locker's model of oral health [63] (Fig. 3)

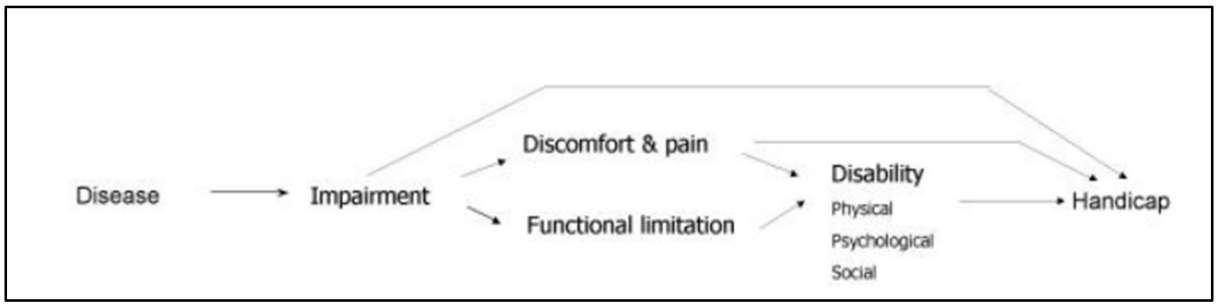


Figure 3: Conceptual model for measuring oral health (Locker 1988)

It consists of 49 questions relating to patients' problems such as eating, speaking, difficulties in social situations, self-consciousness and lack of confidence. Ultimately, it intends to assess the 'social impact' of oral disorders and measure the individuals self-perceived oral health. This includes the dysfunction, discomfort and disability caused by oral health conditions. The purpose of the measure is broad and includes assessing priorities of care by documenting social impact among individuals and groups, understanding oral health behaviours, evaluating dental treatment and providing information for advocating for oral health [(64)]. The OHIP-49 been tested and adapted for use in the edentulous population and has been translated into multiple languages. It has also been recently condensed into a more user friendly shorter format namely the OHIP-14 [(65)].

2.2.5 PROMS in relation to intravenous sedation and implant surgery

It was determined in McCrea's study of intravenous sedation, as an adjunct to dental implant surgery, that there was an overwhelming positive response from patients who received IV sedation using post op satisfaction questionnaires with respect to self-reported measures of anxiety[(66)]. Out of the 173 patients undergoing IV sedation for their dental implants, 4 patients believed that they did not get enough sedation while only 1 patient felt that they would not like to receive IV sedation again. The reason for this was not given. Perhaps, the use of

qualitative research methods in addition to a satisfaction questionnaire would allow further exploration of the negative perceptions of the IV sedation experience.

Discussion

The favourable outcomes associated with dental implants has been well demonstrated in these quantitative studies with improvements in patients' satisfaction and quality of life. The debate may now be directed towards aspects of patients' experiences which may be considered as key influential factors in the immediate and long term outcomes of dental implant treatment.

2.3 Dental anxiety

The third section of the literature review will explore dental anxiety, focusing on aetiology, its effect on pain perception, measurement and management strategies. Dental anxiety is a general term that has been used to encompass the distinct and separate entities of fear, anxiety and phobia [67, 68].

Looking at each of this individually;

- Fear is described as an "actual or activated response" to an imminent threat [69].
- Anxiety refers to an emotional state that is experienced prior to an encounter with the feared object or situation [70].
- Phobia is defined with strict criteria that: the phobic object or situation almost always provokes immediate fear or anxiety; the perceived threat is either avoided or actively endured with intense fear or anxiety; and the fear or anxiety is out of proportion with the actual danger posed by the object or situation [70].

Odontophobia (dental fear) is a 'unique phobia with special psychosomatic components that impact on the dental health of the odontophobic persons'[71]. Anxiety can be further subdivided into trait and state anxiety. An anxiety trait has been defined as a relatively stable tendency towards the kind of anxiety that anyone can suffer when faced with a threatening situation [72]. State anxiety however, is a transitory emotional condition of the human body, characterized by feelings of apprehension, subjective and consciously perceived strain and stimulation of the autonomic nervous system [72]. Due to its situational and transitory state, dental anxiety has therefore been included under state anxiety.

In line with the biopsychosocial 'vicious spiral' concept (Fig 4), Carlsson et al demonstrate that poor oral health status is related to a low level of satisfaction with dental and facial appearance which is in turn related to general anxiety and depression [73]. Completing the vicious cycle, Bernson et al. revealed that those with high dental anxiety and accompanying general anxiety were more likely to demonstrate avoidance behaviours [74].

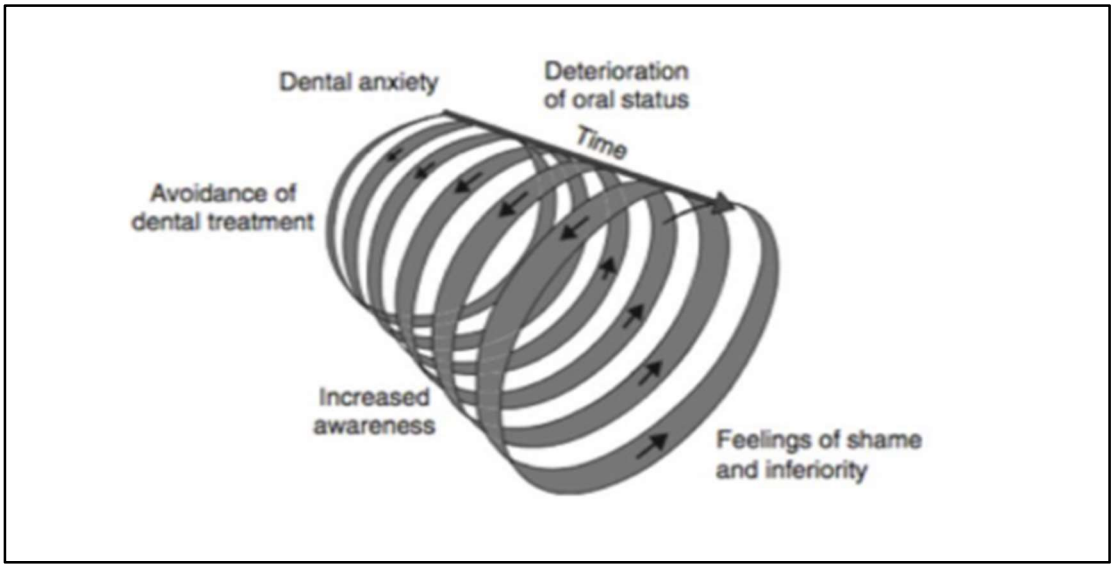


Figure 4: Vicious spiral of dental anxiety, proposed by Hakeberg

Accepting that the latter symptomology of psycho-social predominance may prompt consultation with their general practitioner rather than with their dentist, referral for edentulousness must form an essential part of the holistic intervention umbrella.

Having an insight into the experience of patients undergoing dental implant therapy may provide medical practitioners with sufficient information to aid in the restoration of oral function via onward referral to a dental practitioner.

Population studies from around the world generally report high levels of dental anxiety, that is to say between 10-30% [67, 75]. Dental fear has been shown to cause problems for up to one in five Irish adults [76]. The detrimental effect of dental anxiety is illustrated by a vicious cycle that leads to avoidance of dental visits, associated deterioration in oral health which then leads to emergency-driven visiting. These factors subsequently contribute to the maintenance or exacerbation of dental anxiety (Fig. 5) [77].

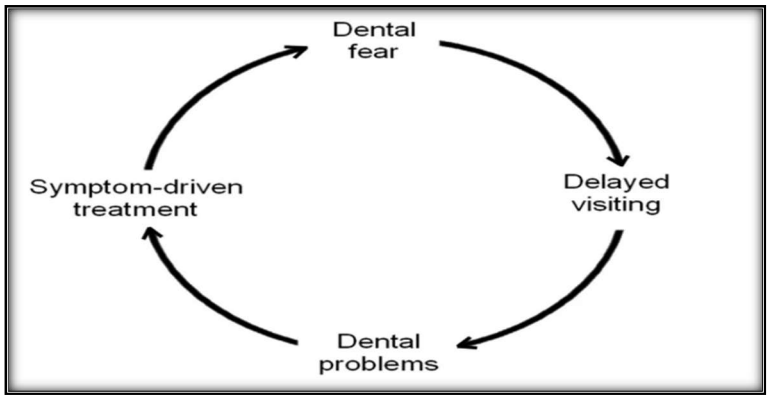


Figure 5: Model of the vicious cycle of dental fear, adapted by Armfield et al (2007) [77]

2.3.1 Aetiology

Dental anxiety can arise due to a plethora of factors, such as previous negative or traumatic experience, a learned response from anxious family members, a lack of understanding,

individual personality characteristics such as neuroticism and self-consciousness, exposure to frightening portrayals of dentists in the media, the coping style of the person, distorted body image, and the vulnerable position of lying back in a dental chair [78-80]. Anxiety can also be induced by sensory triggers such as the sounds and sights of drills and needles, the smells of the dental environment and the vibrations from dental drilling [81].

The investigation or attribution to the cause dental anxiety is based on a biopsychosocial model. This model indicates that there is a relationship between psychological, physiological and social aspects in the aetiology of dental anxiety [82]. The biopsychosocial model involves the interaction of genetic and environmental learning components and can subsequently result in changes to social functioning as well as both biological and psychological health, potentially fuelling the vicious cycle of dental fear even further[82]. While traumatic 'conditioning' experiences have commonly been suspected causes[75], the importance of psychological or emotional factors have in recent years been highlighted. It is now thought that how a person perceives the dental environment is a considerably more important determinant of dental fear than a previous distressing dental experience [83].

It has also been proposed that the origin of an individual's dental anxiety dentally should be classified into one of two groups, termed exogenous or endogenous [84]. Those with an exogenous source of fear arising from a conditioned response to a previous traumatic experience. In comparison, those in the endogenous group, acquire dental anxiety from a manifestation of a constitutional vulnerability to multiple fears or generalised anxiety. The 'Seattle classification' is regarded as a richer and more detailed classification of dental

anxiety. It divides patients into four diagnostic groups: A) anxious of specific dental stimuli, B) distrust of the dental personnel, C) generalized dental anxiety, and D) anxious of catastrophe [85]. Regardless of the classification, it is noted that a number of genetic, behavioural and cognitive factors may contribute to the aetiology of dental fear, anxiety and phobia concluding that an individual's fear is likely to have been created by a multitude of factors [75].

2.3.2 Dental anxiety and pain perception

Dental anxiety has an unequivocal relationship with pain perception[86]. According to the International Association for the Study of Pain, pain is defined as 'An unpleasant sensory or emotional experience associated with actual or potential tissue damage, or described by patients in terms of such damage. Pain can occur if there is a persistent nociception, inflammation, functional, or structural alterations with the central and peripheral nervous systems' [87]. Patients with high trait or dental anxiety tend to require longer surgery times and have more postoperative complications [72].

Treatments associated with different aspects of oral surgery are the major sources of anxiety for patients in dentistry [88]. Dental implant surgery is associated with a high expectancy of pain which accounts for pre-surgery anxiety, whereas the actual feeling of pain is associated with post-surgery anxiety [89]. It has been shown that a patient's level of dental anxiety is the best predictor of pain during the dental implant surgery and post operatively [89]. Fear of pain, claustrophobia, and blood-injury fears are all imperative components of dental anxiety, highlighting its multi-dimensional nature compared to other specific phobias [79].

Broadly speaking, when anxiety exists, a patient is more perceptive of pain and concomitantly is influenced greatly by their expectation of pain [90, 91].

2.3.3 Measuring dental anxiety

The impact and prevalence of dental anxiety has led to recommendations that dentists should assess the degree of patients' fear or anxiety[69]. The benefits of assessment include measuring risk factors, observing changes over time and informing more appropriate and tailored treatment planning [92].

Structured, psychometrically valid scales should be used and many self-report tools have been introduced and subsequently validated.

The most commonly used dental scales for adults include;

- Corah's Dental Anxiety Scale (DAS) [93]
- The Modified Dental Anxiety Scale (MDAS) [94]
- The Revised Dental Beliefs Survey (R-DBS) [95]
- Kleinknecht's Dental Fear Survey (DFS) [96]
- Dental Anxiety Inventory Short Version (DAI-S) [97]
- Index of Dental Anxiety and Fear (IDAF-4C+) [98] which has aimed to address some of the limitations of previously used scales to provide a more holistic assessment

General anxiety scales have also been applied to measure dental anxiety

- Spielberger's State-Trait Anxiety Inventory (STAI-S) [99]
- Hospital Anxiety and Depression Scale-Anxiety subscale (HAD) [100]

At this point it is important to indicate that, although dental fear and anxiety that can be identified by self-reported measures, dental phobia is a specific mental disorder that can only be formally diagnosed by an appropriately trained psychologist or psychiatrist using a structured clinical interview [70].

It is beyond the scope of this literature review to discuss each anxiety scale however the focus will lie on the MDAS and R-DBS used in this study. An overview of the literature pertaining to MDAS and R-DBS will be summarised in the next subsection.

2.3.4 Modified Dental Anxiety Scale

The MDAS is a concise, well-validated five-item questionnaire with 5 point Likert scale responses to each question, ranging from 'not anxious' to 'extremely anxious'. A Likert scale is a rating scale, often found on survey forms that measures how people feel about something. An effective Likert scale include a series of questions, ideally 5-7 with a neutral midpoint. In the MDAS the responses are scored from 1 to 5. The score for the scale ranges from a minimum of 5 to a maximum of 25. The higher the score, the higher the dental fear, and a cut-off point for high dental fear has been suggested at a score of 19, based on clinical relevance [94].

The scale is modification of the original Corah dental anxiety scale (CDAS) which was developed by a New York dental psychologist, Norman Corah in 1969 [93]. This scale had some good psychometric properties but it received a lot of criticism due to its complex answering scheme and local anaesthetic omission. It was felt that this omission was too great as it was the focus of a large proportion of the patients' anxiety. Furthermore, the complex answering consisted of multiple-choice answers which were not clearly in order of severity of anxiety

and were difficult to compare. Lastly some of the answers did not differentiate between a physiological reaction and anxiety.

The MDAS is not the only modification of the CDAS with the development of the Modified Child Dental Anxiety Scale (MCDAS). This child friendly format uses faces to the rating scale which has proven some good psychometric properties [101].

The MDAS was originally used in the United Kingdom in 1995 and has since then been translated into a number of languages including Spanish [102], Portuguese [103], Chinese [104], Arabic [105], Greek [106], Turkish [107], Malay [108], Indian [109] and Tamil [110]. The published psychometrics of these reports is a key indication of this instruments' accessibility, brevity and simplicity. The Likert scale style avoid having to ask patients difficult survey questions like open-ended, fill-in-the-blank, yes/no, select all that apply and ranking questions, thereby adding to its attractiveness.

Recent reports have concluded that the administration of this questionnaire before dental treatment did not increase anxiety [111] and in fact can actually help to reduce it [112]. It can therefore be easily used in practice as an efficient means of guiding the practitioner on the anxiety levels of their patients. Due to the simplicity and ease of administration of this scale, and to make pre-operative anxiety comparable, the MDAS was adapted for use in this study.

2.3.5 Revised Dental Beliefs Survey

The dental beliefs survey was originally developed in 1985 by Milgrom et al to address three key origins of patients concern namely; professionalism, communication and lack of control [85]. It consists of fifteen questions each with a five-point scale. The higher the score, the higher the negative belief that patient has about the dentist. The questionnaire has been translated

into a number of languages, including Norwegian [113], Swedish [114], German [115], and Danish [116] all showing good psychometric properties. Furthermore, it has also been used with English-speaking adolescents in Singapore [117].

In 2005, the DBS was revised and expanded to a 28 questions entitled the revised dental beliefs survey R-DBS. This was to reflect an enhanced understanding of patients' fears. It was still build on the foundation of the three core areas of concern for patients: professionalism, communication and lack of control. The 5-point scale answering system remained in the revised version, but on a Likert scale from 1 being 'never' to 5 being 'nearly always'. Four studies have proven its validity and reliability [95]. In Chicago, an examination of the differences between adults seeking emergency versus nonemergency dental care, higher scores were found for those seeking emergency care [118]. An internal reliability of 0.95 was reported in a sample of dentally fearful adults in Norway. Finally, a total of 108 college students in Seattle and 141 study participants with dental injection phobia completed the Revised Dental Beliefs Survey and found both the internal and test–retest reliabilities of the R-DBS were high. The measure demonstrated good convergent and discriminant validities. This study concluded that the R-DBS is well-suited for use with clinical and nonclinical populations, in which a stable and valid measure of perceptions of the dental situation is desired.

It has not yet however been tested on an Irish population. As the upcoming study includes patients who are not fearful of the dentist, it was considered key to measure patients' perceptions about the dentist in general. Therefore, the R-DBS has been adapted for use in this study.

2.3.6 Management

There are many approaches to managing dental anxiety which can either be categorised as either pharmacological or psychological/ behavioural. The appropriate method of dental anxiety management will vary depending on the level of anxiety, the urgency of the treatment necessary, the patient characteristics and the clinical setting. The pharmacological approaches namely conscious sedation will be discussed in the final section of my literature review.

Behavioural therapies aim to change unacceptable behaviours through provision of information, muscle relaxation and relaxation breathing, hypnosis, acupuncture, distraction, positive reinforcement and giving the patient a sense of control with stop-signalling. More exposure-based treatments, such as systematic desensitization, 'tell-show-do' and modelling have proved hugely beneficial [119]. Cognitive behavioural therapy (CBT) is the psychotherapeutic approach of choice for treating specific phobias [120]. It aims to alter and restructure the content or source of negative cognitions and enhance control over the patients' negative thoughts. The results speak for themselves with dental studies showing substantial rates of reduction in self-reported dental anxiety [121] and more importantly long term benefits due to CBT [122]. Pharmacological approaches may be deemed more appropriate to facilitate immediate dental care whilst CBT may be regarded as the most effective option for treating dental phobia [119].

A combination of both methods may be most appropriate for those with high levels of dental anxiety Symptoms of psychological/ psychiatric disorders should also be considered when

choosing an appropriate management strategy as referral to a clinical psychologist, GP or psychiatrist is the most appropriate course of action in such cases [123]. In some cases, however the patient may not be able to respond to and cooperate with psychological/behavioural approaches or is not willing to undergo these types of treatment or is considered dental-phobic then pharmacological therapies should be sought

The Indicator of Sedation Need (IOSN) which consists of the MDAS and a dental assessment has been shown to be a useful and valid method for dentists to assess the clinical need and justification for conscious sedation [124].

2.3.7 Conclusion

Dentistry is constantly evolving. The fear associated with patient-dentist interactions is being acknowledged and addressed more commonly, leading to more positive dental experiences for patients. Because dental anxiety has such widespread significant impacts, it is crucial not only to efficiently identify dentally anxious individuals but also to treat them appropriately. It should be the aim and ambition of any dentist to alleviate the fear and anxiety that a patient experiences and to manage this in a positive way. This will ensure a long term rapport, confidence and above all trust in the dentist.

2.4 Conscious Sedation

The final section of the literature review will look at the provision of conscious sedation in Ireland.

Conscious sedation, as defined by the Irish Dental Council (IDC), refers to a carefully controlled technique in which a single drug or a combination of oxygen and nitrous oxide is used to

reinforce other behaviour management techniques in a way, which allows dental treatment to be performed in a comfortable manner for the patient. The technique used must ensure that verbal communication with the patient is maintained throughout the procedure, protective reflexes remain intact, and the patient must be able to breath spontaneously. The technique must carry a margin of safety wide enough to render unintended loss of consciousness unlikely [125].

In Ireland, as dictated by the IDCs guidelines, a single drug Midazolam is used and titrated against the patient's response. This is called intravenous conscious sedation (IVCS). Nitrous oxide and oxygen inhalation sedation is also used and is proven to be a safe [126, 127] and effective adjunct with the capability of facilitating dental anxiety reduction [128]. However, due to the limited depth of sedation achieved and the interference of the nasal hood for implant surgery, IVCS is the preferred method of choice. The IDC does not yet support the use of advanced or alternative conscious sedation techniques. These include any form of sedation in children other than nitrous oxide/oxygen, combined routes of sedation (e.g. oral and IV), combinations of drugs (e.g. Midazolam and opioid, midazolam and propofol) and certain drugs like propofol and Ketamine.

According to a systematic review undertaken in 2016, Midazolam was found to be the most commonly used and safest drug to be used for successful conscious sedation [129]. Midazolam is a benzodiazepine which is the currently the most widely accepted drug of choice for IV and oral conscious sedation [130]. Generally speaking, 'titratable' drugs are safer and preferred for intravenous titration to the desired stage of sedation and analgesia. The added advantage of Midazolam is that it is reversible with an antagonistic drug called Flumazenil.

The publication of 'A Conscious Decision' in 2000 ended the provision of general anaesthesia (GA) in general dental practice and has led to an increased emphasis on the use of conscious sedation in the dentistry [131]. Wilson et al. highlighted the effectiveness of this change with 98% of patients, who would have previously been referred for GA, completing their course of treatment using IVCS [132].

Selection of patients who can be treated under intravenous conscious sedation is essential to ensuring appropriate patient care and avoiding adverse outcomes [48]. In a study looking at the major determinants of patients receiving intravenous conscious sedation it was found that gross caries, higher dental fear, negative beliefs about dentists, lifetime diagnosis of generalised anxiety disorder, fewer comping skills were all positive predictors [133].

As previously mentioned for many patients' dental anxiety is an enormous barrier to dental care, resulting in avoidance or delayed attendance. The use of conscious sedation techniques has improved access to dental care for a large cohort of these patients. It appears that the availability of conscious sedation in a general practice setting is on the rise, but as yet its availability may not be meeting demand [134].

A survey carried out in Ireland in 2011 gives an indication of the practice of conscious sedation in general dental practice [135]. This survey looked at dentists' opinions, training and choice of conscious sedation techniques and had a response rate of 45%, with 129 useable questionnaires. Most dentists (76%) agreed that there is a need for conscious sedation in general practice, but only 30% and 18% provided sedation to adults and children respectively. These figures seem quite low given the perceived need for sedation, and it appears the main barrier to the provision of sedation is a lack of training opportunities. This survey emphasized a similar finding by Quinn et al published in 2006 which found that there was a big interest

amongst Irish health board dentists in the provision of sedation but actual levels of provision were relatively low, especially for inhalation sedation (4%) and intravenous sedation (8%) [136]. A lack of training opportunities was again cited as the main barrier to the increased provision of sedation.

2.5 Summary and limitations of current literature

The literature review gives an important background and introduction to dental implant surgery, highlighting the extensive research that is ongoing into this relatively novel field of dentistry. The scale of research correlates with the increasing demand for implants, with all research on section 1 published within the last two decades. A synthesis of key qualitative studies was carried out followed by a review of quantitative data in relation to patient reported outcomes. The review also addressed prevalent themes across the research including dental anxiety, its aetiology, effect on pain perception, measurement and management strategies. Finally, the provision of conscious sedation in Ireland was also examined.

The majority of respondents were older patients with extensive tooth loss and focused on experiences prior to and after treatment instead of looking at the treatment period itself. They have also focused on implant-retained prosthesis such as implant supported overdentures instead of single implant restorations. Coupled with this, there was very little reporting on younger patients' dental implant experiences. There have been high degrees of patient satisfaction post implant surgery linked with high expectations.

Apart from two studies, there is a paucity of published research on the experience of the actual dental implant surgery. The majority of studies were retrospective with patients having finished their implant treatment completed prior to qualitative exploration. Very few studies interviewed patients in treatment at the time of interview. Only one study looked at the complications of dental implant surgery and there was a significant lack of emphasis on the importance of maintenance of dental implants. The most considerable finding from this synthesis of key qualitative studies was the overwhelming lack of reporting on patients' experiences of receiving dental implants under conscious sedation. It is difficult to advocate

for the use of conscious sedation when there is little to no research on the patients' experience of it. It is therefore paramount that future work must focus on addressing this deficiency in this part of the literature.

Despite the technological advancements in dentistry, dental anxiety remains high. When psychological/ behavioural methods fail to work pharmacological methods need to be deployed. It is clear from the literature that there is a demand for the provision of conscious sedation but this is met with a lack of training opportunities for dentists.

Improving patient experience does not require the provision of unnecessary care, it requires clear communication with the patient around why the care is being provided in the best interests of the patient. Patients seek not only high-quality compassionate care but they also want an understandable explanation of their treatment plan. Having insight into the patient experience could enable and promote total quality of care improvement.

3.0 Aims and Objectives

3.1 Knowledge Gap

As per the summary in 2.5, there is relatively little qualitative evidence available on the patients' experience of dental implant surgery and in particular if intravenous conscious sedation has an adjunctive effect on this experience. Addressing this gap through further research is fundamental to enhancing patient care, improving patient outcomes and ensuring a loop of continuous improvement particularly with an increased use of IVCS in the dental setting. None of the studies referred to in section 1 of the literature review were carried out in Ireland and the R-DBS tool specifically has not been used in a study for dental implants within Ireland. With the increased use of IVCS for dental implants in Ireland over the past 15 years, it is therefore apt that there is appropriate research to address this trend.

3.2 Aim

The aim of this study is to qualitatively analyse the patients' experience of dental implant surgery with or without intravenous conscious sedation with a view to understanding their needs and demands with respect to implant surgery.

3.3 Objectives

This study undertook in-depth exploration of patients' experiences of the dental implant surgery stage with or without intravenous conscious sedation through iterative qualitative semi-structured interviews.

The objectives of this study were to

- Explore patients' thoughts, understanding and motivations with regard to their implant treatment specifically the surgical stage

- Explore the adjunctive effects that intravenous conscious sedation has on the surgical stage
- Gather feedback on existing information resources related to dental implants and intravenous conscious sedation

4.0 Methods

This section discusses the methodology underpinning the current research methods, as well as detailing the research methods used.

4.1 Methodology

As previously detailed, there are three types of research methodology: quantitative, qualitative and mixed methods approaches. In contrast to quantitative research, qualitative research aims to interpret data to understand, describe and explain interactions, experiences and perspectives of a phenomenon [137]. To appropriately address the aims and fulfil the objectives of this research, it was deemed that qualitative research was the most fitting approach to take in order to fully appreciate the patients experience of dental implant surgery.

4.2 Study Design

This was a qualitative study, which aimed to explore the patients' experience of dental implant surgery with or without intravenous conscious sedation. On the day of the procedure, the R-DBS & MDAS questionnaires were issued to patients for self-completion and returned to the lead investigator. Data collection was carried out seven days after dental implant surgery, using in depth semi-structured telephone interviews. The interviews were manually transcribed by the lead investigator and imported into a qualitative software tool (Nvivo). The data was then analysed using a thematic framework and themes and subthemes were identified.

In order to contextualise the data, a preoperative MDAS questionnaire and R-DBS was used to assess the patient's level of anxiety. As referred to previously, R-DBS has not been used in the Irish setting prior to this review but its merits, as discussed in the literature review section 2.3.5, demonstrate its appropriateness for measuring patients' perceptions of their dental care.

4.3 Ethical Approval

Ethical approval for the study was granted by the Cork Research Ethics Group (CREC) (Appendix 1)

4.4 Participants

Sampling in qualitative studies is undertaken with the aim of achieving the objectives of the research by including subjects that are relevant to the main questions of the research [138]. It is important to conduct robust qualitative sampling which demonstrates the diversity of study participants. This ensures that the data collected is of sufficient depth and richness.

Participants were selected for interview prior to surgery at a dental implant consultation clinic during a six-month period using purposive sampling. At these clinics, the study was explained, patients were invited to participate and given an information leaflet regarding the study (Appendix 2). Patients were therefore given adequate time to consider the information and make an informed decision to consent. On the day of their procedure if the patient decided to participate, any further questions were clarified and the patient signed the consent form (Appendix 3).

Demographic information, including name, age, occupation, and extent of tooth loss were reported from the patient's clinical records and recorded in the research diary before the

interviews. These provided descriptive information for the patients during analysis, quotations and data interpretation when required.

Patients were recruited until theoretical saturation was achieved. Theoretical saturation is the point in data collection that is achieved when no new themes emerge from the latest collected data [139]. This point was agreed upon by experts in this field based on the overall quality of the data in light of the research aims and objectives.

Sample size was also considered in this study. According to the literature, between 6 and 10 interviews may be sufficient to reach data saturation when the research question is focused and the participants have similar characteristics [140].

Two groups of patients were investigated, those who received intravenous conscious sedation and those that didn't. The implant systems used were two-stage systems from two manufacturers (Nobel Biocare and Straumann). The dental implant surgeries were performed in the Cork University Dental School and Hospital by the one operator.

4.5 Inclusion and exclusion criteria

The inclusion and exclusion criteria for the study are shown below (Table 2).

Table 2 : Inclusion and Exclusion Criteria

Inclusion Criteria	**Exclusion Criteria**
ASA 1 or 2	ASA 3+
First time receiving a dental implant	Previous dental implant experience
Adults >18 years	History of depression/Psychiatric illness
	History of radiotherapy to the head and neck
	Pre-existing chronic pain condition of the head and neck region i.e. Oral Dysaesthesia, Persistent Idiopathic Facial Pain
	Pregnancy
Patient Consent	Patient refusal

4.6 Pre Surgical Questionnaires

Patients were required to complete the MDAS (Appendix 6) and R-DBS (Appendix 7) questionnaires on the day of surgery. This was a self-administered questionnaire, completed in private at the clinic.

It was anticipated that this additional data may help to contextualise and elucidate the emergent themes and trends and see how these may differ between individuals. The MDAS was selected as it is a succinct 5 question questionnaire and can be answered in a short timeframe by the respondents and gives a reliable baseline to access pre-treatment anxiety.

This was complemented with the use of the more detailed Revised Dental Belief Survey which was more in-depth and centred on patients self-perceived relationship with their dentist under themes of professionalism & ethics, communication and control.

4.7 Formal Qualitative Training

Formal training was undertaken by the lead investigator with the HRB-HRTN (May 2019) and the Social Research Authority in the United Kingdom in November 2019. The HRB-HRTN two-day course entitled 'Working Qualitatively in Trial and Healthcare Methodology Research' gave a broad overview as to what qualitative research entails. The Social Research Authority is the professional membership body for social researchers. The courses entitled 'Conducting interviews and focus groups' and 'Analysing qualitative data' involved lectures, as well as practical exercises in interviewing skills and analysing qualitative date. Practice interviews and focus groups were also carried out as part of the course.

4.8 Qualitative interviewing

There are several methods used in qualitative research to gather data. These include qualitative interviews, observations and focus groups. Qualitative interviewing has been extensively used in qualitative research and is defined as 'A social encounter where speakers collaborate in producing retrospective (and prospective) accounts or versions of their past (or future) actions, experiences, feelings and thoughts' [141].

Qualitative interviewing was identified as the most appropriate technique to use in this research project. This is due to the fact that qualitative interviews can provide deep insights and understandings of patients' views, thoughts and opinions, which are needed to fulfil this research's aims and objectives. Furthermore, patients are given the opportunity to disclose

their experiences without being guided by the investigators views or pre-assumptions. Finally, interviews are particularly pertinent when discussing sensitive topics, for example, the experience of tooth loss, which some patients would find too difficult to disclose in a focus group.

After choosing interviewing as the method of data collection, consideration was given to the type and style of interview to be used. In depth semi-structured qualitative telephone interviews were selected. The main advantage of telephone interviews over face-to-face interviews are cost-effectiveness, time effectiveness and their suitability when interviews involve discussing sensitive issues [142]. The fact that the patients were recruited after face-to-face contact at the implant consultation clinic, where an initial rapport was established, maximised the quality of the telephone interview data.

Prior to undertaking the interviews, a topic guide was generated following an extensive literature review of patient experience pre and post-surgical interventions in either the medical or dental field. The topic guide enabled a structure and sequence to the questions posed, while at the same time offering scope for development, clarification and exploration within the discussion. Following an initial draft this topic guide, it was then reviewed by an expert group consisting of specialists in oral surgery/restorative dentistry, who commonly carry out implant placement, as well as dental nursing staff involved in conscious sedation and implant placement procedures (Appendix 5).

The topic guides were intended to act as a prompt during interviews but were not strictly adhered to. The semi-structured format of the interviews allows patients to discuss areas that are not included in the original topic guides. Open-ended questions allow patients to articulate their perspectives and experiences freely and spontaneously. The topic guides were

then modified after each interview to include new and emerging topics that were not previous included.

The in-depth semi structured interviews were carried out in a private room within the Oral Surgery department of Cork University Dental School and Hospital 7 days after the patient had completed their dental implant surgery. All interviews were directed by the same researcher using a topic guide that was iteratively updated in accordance with the emergent themes throughout the study and after each interview.

As previously referred to, the interviews were carried out over the phone and recorded using a digital Dictaphone. Patients were advised that the interviews would be recorded and verbal consent was gained prior to the interview beginning to ensure compliance to data protection and privacy legislation. They were also informed of their right to withdraw from the interview at any point, that what was discussed was strictly confidential and anonymous and that they were not obliged to answer any question that made them feel uncomfortable. The independence of the research from their clinical care was made clear to the patient in order to encourage honest and open expression of their viewpoint. No time limit was set for the interviews and they continued until the patient had no further information to give. Recruitment and interviews continued until no new themes emerged and theoretical saturation had been achieved

The interviews were transcribed verbatim by the lead investigator using Microsoft Word. All interviews and transcribed data was anonymised and uploaded and stored on a secure drive, only accessible by password by the lead investigator, as per General Data Protection Regulation (GDPR) guidelines (143). Once uploaded, they were deleted from the Dictaphone.

4.9 Qualitative analysis

A qualitative software programme was used to aid in data management and thematic analysis. The software used was NVivo and prior to data analysis the lead investigator attended a 2-day course on NVivo software training.

NVivo qualitative data analysis software; QSR International Pty Ltd. Version 11, released in 2015, is a computer aided analysis system used for qualitative and mixed-methods research. Specifically, it is used for the analysis of unstructured text, audio, video, and image data, including interviews, focus groups, surveys, social media, and journal articles. Compared with manual methods, NVivo aids the process of data analysis and facilitates organisation and display of the data in a more systematic and accessible way [(144)]. Importantly, such software also serves as a tool for transparency. Arguably, the production of a quality audit trail is the most important criteria on which the trustworthiness and plausibility of a study can be established. Qualitative analysis software's logging of data movements and coding patterns, and mapping of conceptual categories and thought progression, render all stages of the analytical process traceable and transparent, facilitating the researcher in producing a more detailed and comprehensive audit trail than manual mapping of this complicated process can allow [(145)]. Below is an example of the software interface (Fig 6)

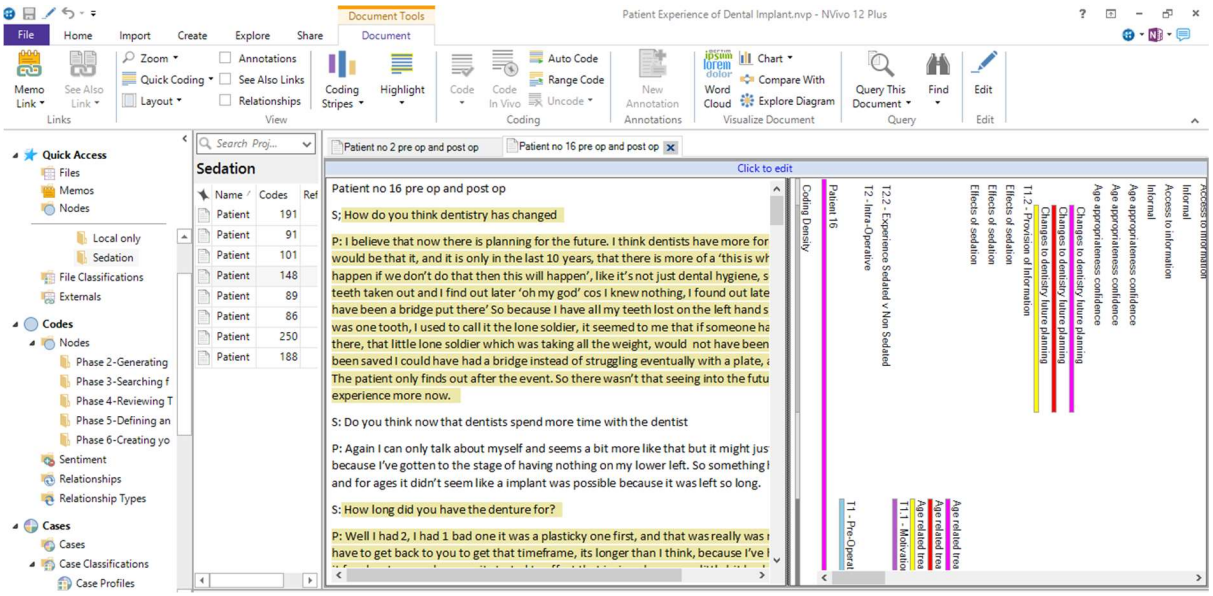


Figure 6: NVivo Interface

Qualitative data analysis comprises a sequence of stages whereby the researcher transforms the textual data that has been gathered, into a report of the findings. The data analysis methodology used in this study is based on the principles of thematic analysis [146]. This analysis is frequently used in health and social research due to its flexibility in answering qualitative research questions, while still maintaining a systematic approach.

4.10 Thematic analysis: Overview of the process

While qualitative research is not given to statistical abstractions, it is nonetheless systematic in its approach to data collection and analysis. Thematic analysis is a method of identifying and reporting trends or themes within the data. A theme, often called a code, is a text or excerpt from the data itself, which captures an important meaning or pattern in relation to the research question. This theme, or code consists of several subthemes or sub codes that are related to the main topic of that theme. Themes are used to interpret various aspects of the research question thereby facilitating reporting of the findings.

There are six key phases to thematic analysis as defined by Braun and Clarke, 2006 [147] however it must be emphasised that this analytical process is not a consecutive process of simply moving from one phase to the next. It is an iterative and circular process back and forth through the phases to achieve the development of data over time.

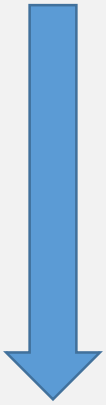
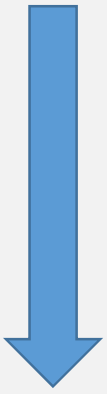
- **Phase 1:** *Importing and Familiarising* involved importing the interview transcripts and related field notes into NVivo. Because the lead investigator interviewed, recorded and transcribed the interviews verbatim they were quite familiar with the raw data. Nonetheless the interviews were replayed and reread a number of times to gain a thorough insight into the content of the data. Furthermore, initial ideas were noted.
- **Phase 2:** *Generating Initial Codes (Open Coding)* involved reading each transcript line by line and highlighting the various segments with a colour and non-hierarchical general code. (Appendix 10 - Codebook-Phase 2-generating initial codes)
- **Phase 3:** *Searching for Themes (Developing Categories)* involved reading through the codes that had been generated from the data and grouping codes that were related into categories (Appendix 11 - Codebook – Phase 3 – searching for themes)
- **Phase 4:** *Reviewing Themes (Drilling Down)* involved breaking down the now restructured categories into sub-categories to offer more in-depth understanding of the main aspects under scrutiny and to consider divergent views, attitudes, beliefs and behaviours (Appendix 12 - Codebook – Phase 4 – reviewing themes)
- **Phase 5***: Defining and Naming Themes (Data Reduction)* involved consolidating the main themes and subthemes from the data which were sent to the research supervisor for approval. Agreement was reached on the final emergent themes and

the data was deemed sufficient to reach thematic saturation (Appendix 13 - Codebook-Phase 5-defining and naming themes)

- **Phase 6:** *Producing the report* involved discussing all themes from the data, linking them with current literature and facilitated by interviewee quotations.

Table 3 now links the phases and processes outlined above and conducted in NVivo to the practical guidelines as set out by Braun and Clarke, 2006 [147]. Their six step approach to conducting thematic analysis is displayed in the first column while the second column displays their corresponding application in NVivo. The third column shows the strategic elements of coding as the researcher moved from initial participant-led descriptive coding to the seconding coding which was more interpretive, to the final abstraction to themes which is entirely researcher led. The fourth column shows the iterative nature of the tasks as the coding, analysis and write up proceeds towards conclusion.

Table 3 : Analytical Hierarchy to Data Analysis (Adopted from Braun and Clarke - six stages of analysis)

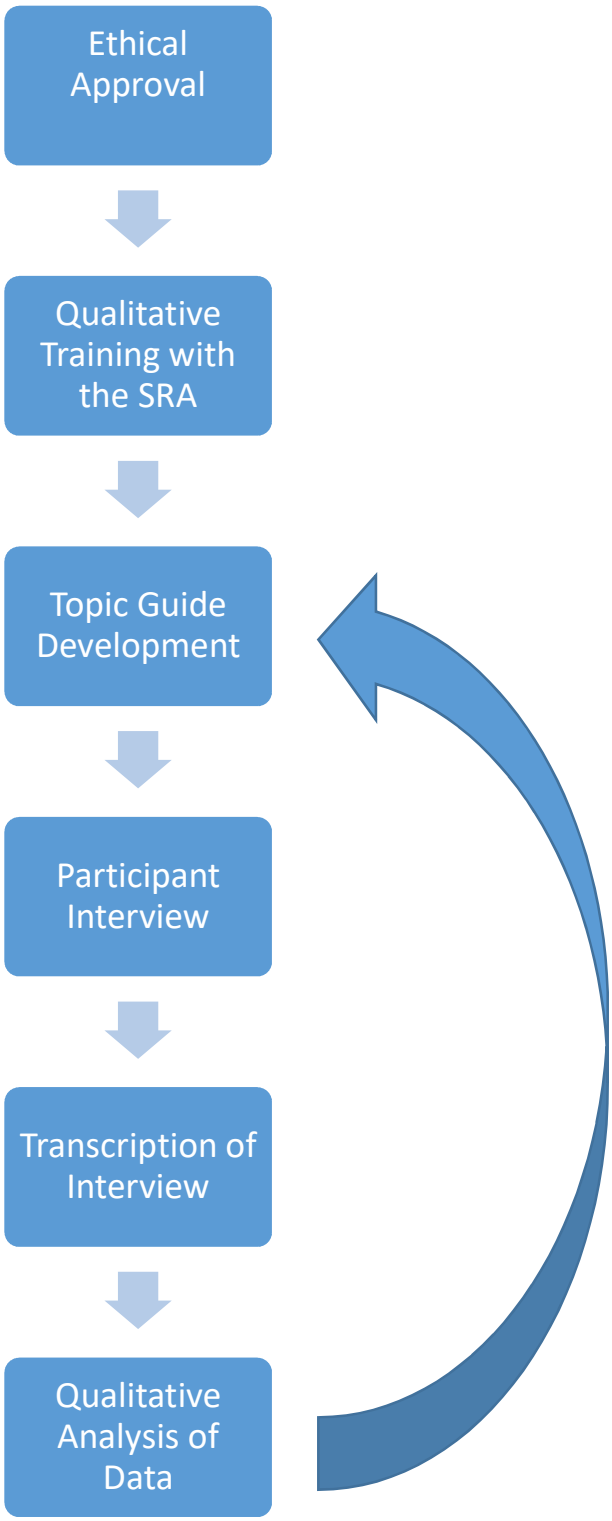
Analytical Process (Braun and Clarke, 2006)	**Braun and Clarke Practical Application in NVivo**	**Strategic Objective**	**Iterative process throughout analysis**
1. Familiarising yourself with the data	Transcribing data, listening to the audio files, reading and re-reading the data, noting initial ideas. Importing data into NVivo data management tool	Data Management (Open and hierarchal coding through NVivo)  Descriptive Accounts (Reordering 'coding on' and annotating through Nvivo)  Explanatory Accounts (Extrapolating deeper meaning, drafting summary statements and analytical memos through NVivo)	Assigning data to refined concepts to portray meaning  Refining and distilling more abstract concepts  Assigning data to themes/concepts to portray meaning  Assigning meaning  Generating themes and concepts
2. Generating initial codes:	Open coding-highlighting interesting features of the data in a systematic fashion across the entire data set. Collecting data relevant to each code		
3. Searching for themes:	Categorisation of Codes-Collating codes into potential themes, gathering the data relevant to each potential theme		
4. Reviewing themes:	Coding on-Checking if the themes work in relation to the coded extracts. Generating a thematic 'map' of the analysis		
5. Defining and naming themes:	Data Reduction-On-going analysis to refine the specifics of each theme. Generating clear definitions and names for each theme. Discussion with supervisors ensuring data saturation was achieved and no further interviews required		
6. Producing the Report	The final opportunity for analysis. Selection of vivid, compelling extract examples, final analysis of selected extracts relating back to the research question and literature, producing a scholarly report of the analysis		

4. 11 Rigour and Trustworthiness

Qualitative research, unlike quantitative, cannot be measured by sensitivity, reliability, bias or validity. It relies solely on the transparency of the research conduct and reports. The audit trail and codebooks generated by NVivo ensures this transparency. Any ambiguity in the data was clarified with the research supervisor as well as an experienced qualitative researcher to ensure theoretical saturation had been achieved and to ensure comprehensiveness of coding and data analysis.

4.12 Summary of the Method

The methodology employed in this research project is summarised in Fig. 7



The Topic Guide was revisited each time a qualitative analysis was concluded for an interview. This allowed for further identification of themes for subsequent interviews through an iterative process.

Figure 7 : Summary of the Method

5.0 Results

5.1 Participants and interviews

Patient recruitment continued over the year 2020 (minus the 6 month covid-19 related lockdown) until data saturation was achieved (Table 4).

Table 4: Data Saturation

Patient Interview Representation in Themes	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
T1 - Pre-Operative	23	28	20	19	16	18	11	19	14	12	11	8	11	7	10	14	7	7
T1.1 - Reasons for tooth loss	1	1	1	1	1	1	0	1	0	0	1	0	0	0	2	0	0	0
T1.2 - Anxiety	8	12	4	1	6	4	2	5	3	2	4	0	1	1	1	1	1	1
T1.3 - Motivation	3	7	4	3	2	4	2	3	5	3	0	2	4	3	1	4	0	0
T1.4 - Provision of Information	10	11	5	11	10	5	4	9	6	5	5	4	4	2	4	6	4	5
T1.5 - Cost	3	3	2	2	0	2	3	1	1	1	0	2	1	1	2	2	1	0
T1.6 - Dental Tourism	0	3	4	2	1	2	1	0	2	2	2	0	1	0	1	1	2	1
T2 - Intra-Operative	18	13	8	11	11	3	4	7	4	4	3	8	5	3	5	9	6	6
T2.1 - Operating Surgeon	3	2	6	2	3	0	1	1	0	1	1	1	1	1	0	3	0	0
T2.2 - Intra-operative anxiety	2	0	1	2	4	1	0	0	1	0	0	1	0	0	0	4	2	1
T2.3 - Cannulation	4	1	4	1	7	0	1	4	3	0	1	4	3	1	2	7	3	1
T2.4 - Effects of IVCS	14	11	4	4	13	3	3	3	4	0	2	6	4	3	5	6	5	3
T2.6 - Dental Implant Drill	3	0	5	7	1	1	1	2	0	0	1	1	1	1	2	2	0	4
T3 - Post-Operative	4	7	8	6	5	3	6	2	1	2	1	2	1	2	8	2	2	4
T3.1 - Pain	1	1	4	2	0	2	0	0	0	1	1	0	1	2	2	1	2	0
T3.2 - Post-operative Instructions	3	8	5	3	5	1	6	2	1	1	0	2	0	0	6	2	1	1
T3.3 - Follow up	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	3
T3.4 - Postoperative Anxiety	3	6	10	1	4	1	4	0	2	1	3	2	2	1	2	1	2	3
T3.5 - Repeating the experience	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
T3.5 Local Anaesthetic Injection	1	3	0	0	3	0	1	3	1	3	2	3	0	1	2	1	1	2
Total Comments Coded	105	119	98	83	97	57	57	70	57	48	49	58	53	43	70	82	56	62

Twenty patients were invited to take part in the study with 2 patients declining participation. Eighteen semi-structured telephone interviews were conducted, 7 days post-operatively, at a time that was convenient to the patient.

Eight of these patients had dental implants placed under intravenous conscious sedation (IVCS), while 10 of them had dental implants placed with local anaesthetic (LA) only.

Due to the semi-structured nature of the interviews, there was no time limit allocated and therefore the interviews varied in length from 25.21 minutes to 60.69 minutes. The average length of an interview for a patient that had received IVCS was 40.40 minutes. This differed from the average length of time for a patient who received a dental implant under LA only at 31.80 minutes. Naturally the lengths of the interviews for both cohorts of patients are distinctively different due to the extended topic guide relating to IVCS.

5.2 Participant demographics

All participants were Irish adults who had privately paid for dental implant treatment under the same consultant in Cork University Dental School and Hospital. The consultant is identified by the letters PS. At the time of the interviews, nine interviewees were employed, two were housewives, one was a student and six were retired. Of the patients that received IVCS, six were female and two were male. Of the patients that received LA only, seven were female and three were male. The average age of respondents was 54 years old, with the youngest being 19 and the oldest being 74 resulting in a range of 55 years. Table 4 shows a summary of the patient demographics.

Table 5: Patient Demographics

Respondent ID	Age	Gender	Occupation	IVCS
Patient 1	24	F	Student	Y
Patient 2	30	F	Hairdresser	Y
Patient 3	57	M	Solicitor	N
Patient 4	64	M	Engineer	N
Patient 5	67	F	Unemployed	Y
Patient 6	54	F	Researcher	N
Patient 7	63	F	Retired Nurse	N
Patient 8	19	F	Student	N
Patient 9	66	F	Nurse	N
Patient 10	56	F	Retired Care Assistant	N
Patient 11	45	F	Yoga instructor	N
Patient 12	63	F	Housewife	Y
Patient 13	50	F	Medical Secretary	N
Patient 14	55	M	Restauranteur	N
Patient 15	72	M	Retired Farmer	Y
Patient 16	68	F	Retired Finance	Y
Patient 17	58	F	Housewife	N
Patient 18	74	M	Retired	N

5.3 Modified Dental Anxiety Scale (MDAS) Questionnaire

The MDAS is a brief, 5 item questionnaire with a consistent answering scheme for each item ranging from 'not anxious' to 'extremely anxious'. It is summed together to construct a Likert scale with a minimum score of 5 and a maximum of 25 (Table 5). A cut-off value of 19 and above has been determined empirically to indicate high dental anxiety that may require special attention by dental personnel.

Table 6: Total patient scores and associated levels of anxiety

MDAS Score range	Anxiety Levels
0-5	Not anxious
6-10	Low anxiety
11-14	Moderate anxiety
15-18	High anxiety
19-25	Extreme anxiety

The first results table (Table 6) shows the total MDAS scores by the total number of patients in each score.

Table 7: Total MDAS scores by the total number of patients

Anxiety level	MDAS Total	Number of patients per score
Not anxious	**5**	**2**
Low anxiety	**6**	**1**
	7	**2**
	8	**1**
	10	**2**
Moderate anxiety	**11**	**3**
	12	**2**
	13	**1**
High anxiety	**15**	**2**
	17	**1**
Extreme Anxiety	**21**	**1**
		18

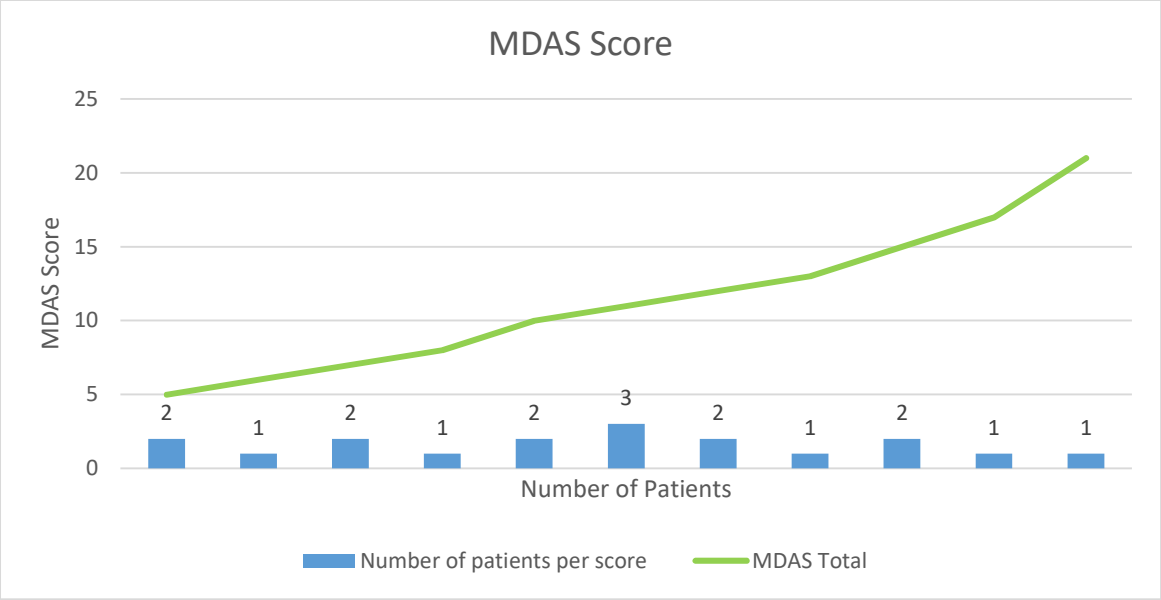


Figure 8: MDAS Score (Patients per score)

As illustrated in Fig 8, out of the 18 respondents, 11.1% reported not being anxious about the procedure, 66.6% has low to moderate anxiety and 22.2% had high to extremely high anxiety.

Only 1 patient scored >19, which indicates high dental anxiety that may require special attention by dental personnel. The same information was split between sedated and non-sedated groups as illustrated in Figure 9.

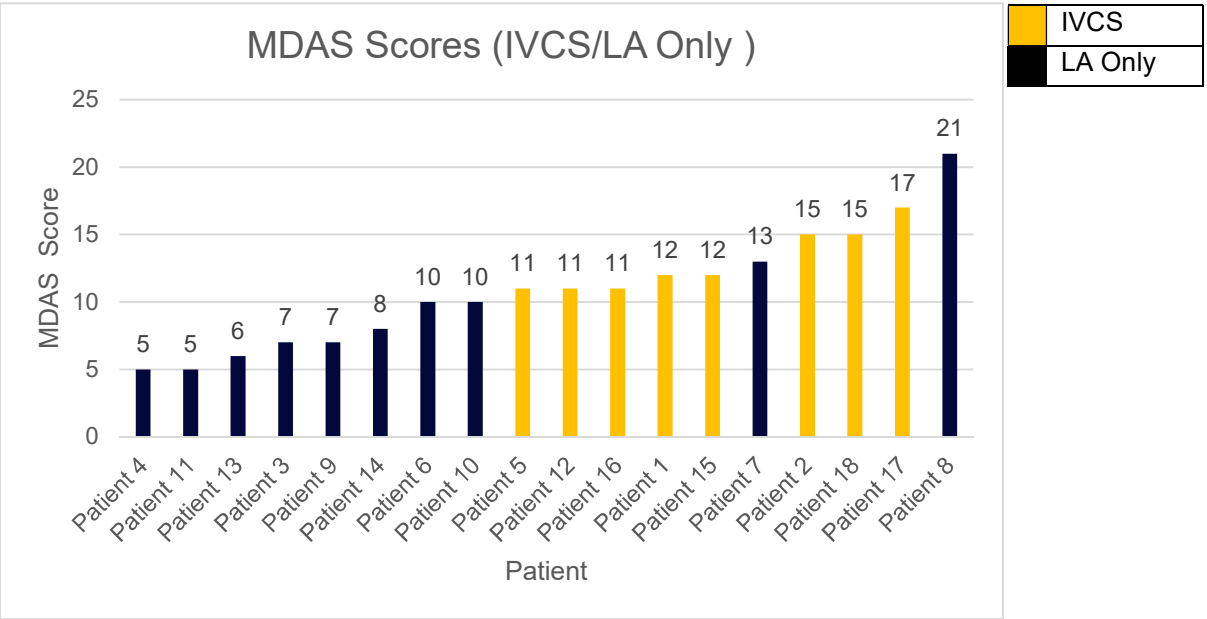


Figure 9 : MDAS Scores (IVCS/LA Only)

Figure 9 shows a clear correlation with higher total MDAS scores and patients opting for sedation, with one outlier.

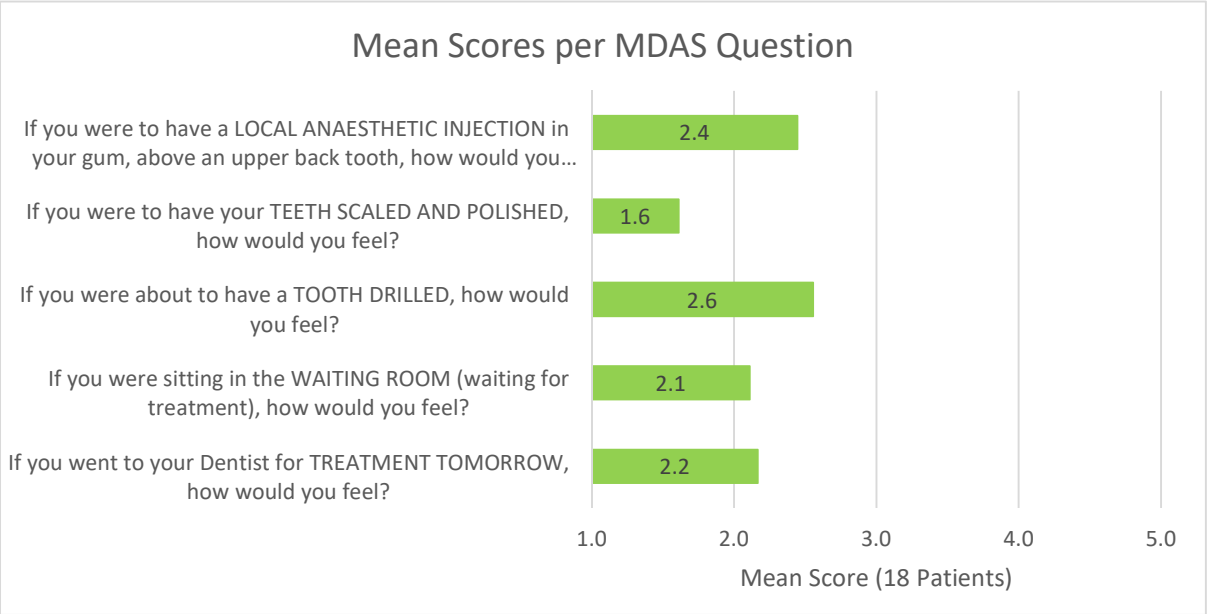


Figure 10 : Mean Scores per MDAS Question

Considering now any further insights from the MDAS, as illustrated in Figure 10, the question that generates the highest level of anxiety is on the topic of tooth drilling with a mean score of 2.6/5 across the 18 patients surveyed. This may be significant considering the context of this study and a requirement to use the dental drill in the procedure. It may also be as this is perceived to be an invasive procedure in comparison to something such as scaling and polishing.

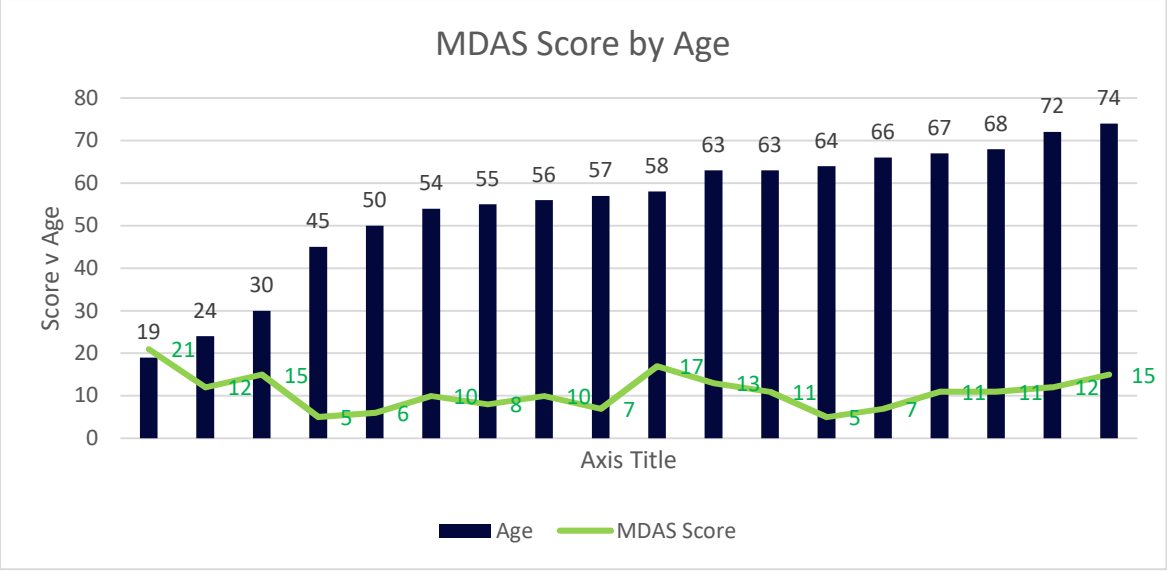


Figure 11 - MDAS Scores v Respondent Age

Broadly, as evidenced in Figure 11, there seems to be no definitive correlation between age and anxiety scores. However, when looking at Anxiety based on occupation status (Full time employed Y or N) there is a noticeable relationship between these two metrics as demonstrated in Figure 12 with one outlier.

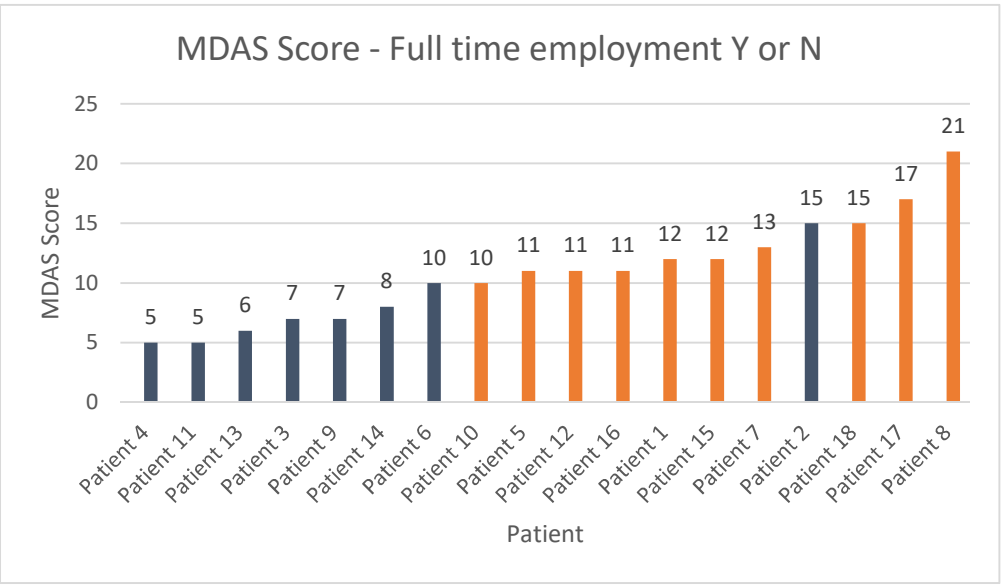


Figure 12 : MDAS Score v Occupational Status

5.4 Revised Dental Belief Survey (R-DBS)

As previously explored at length in the literature review (section 2.3.5), the R-DBS instrument contains 28 items and is suggested to cover three theoretical dimensions: professionalism or ethics (level 1: items 1-11), communication (level 2: items 12-20), and lack of control (level 3: items 21-28). It is broadly used to measure the patients' perception of the dentist under the aforementioned subscales. The outcome of the R-DBS is a sum of scores ranging between 28 (highly positive) and 140 (highly negative).

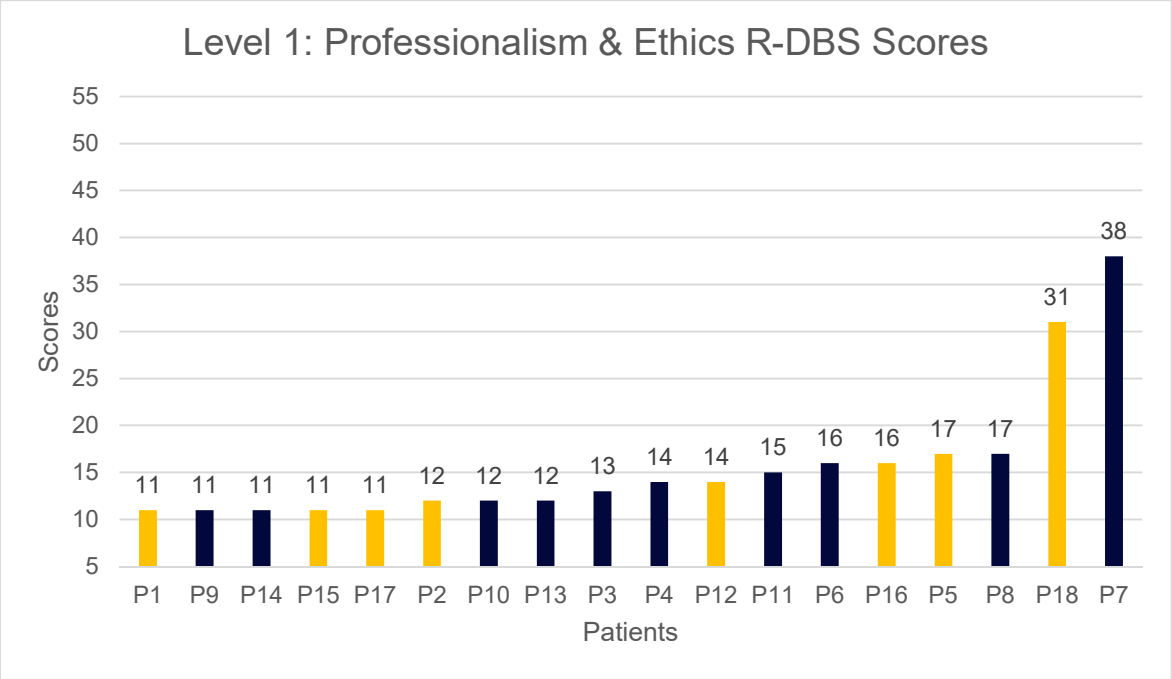


Figure 13 : R-DBS – Level 1 Scores Professionalism & Ethics

Level 1 R-DBS scores as illustrated in Figure 13 reflect the respondent's view of the professionalism or ethics displayed by the dentist. The minimum score is 11 (professionally

and ethically high) while the maximum score is 55 (professionally and ethically low). The average score was (282/18) 15.67 revealing a high professional and ethical attitude of the dentist. The modal score was 11, indicating across the 11 items 5 respondents felt that the dentist exhibited professionalism/ethics without any concerns raised. The average score in the sedated group was (123/8) 15.37 versus the non-sedated group (159/10) 15.9 revealing similar professional and ethical attitudes held by both cohorts of the dentist.

Considering now in Figure 14, the mean scores across 11 questions, and any data insights, there is little variation between the scoring of IVCS and Non IVCS patients and without exception these are below a mean score of 2.0. The greatest variation is seen in Q3 regarding 'technical competency & quality' with a slightly lower (positive) score reported by IVCS patients when compared to the LA only group although this may be insignificant.

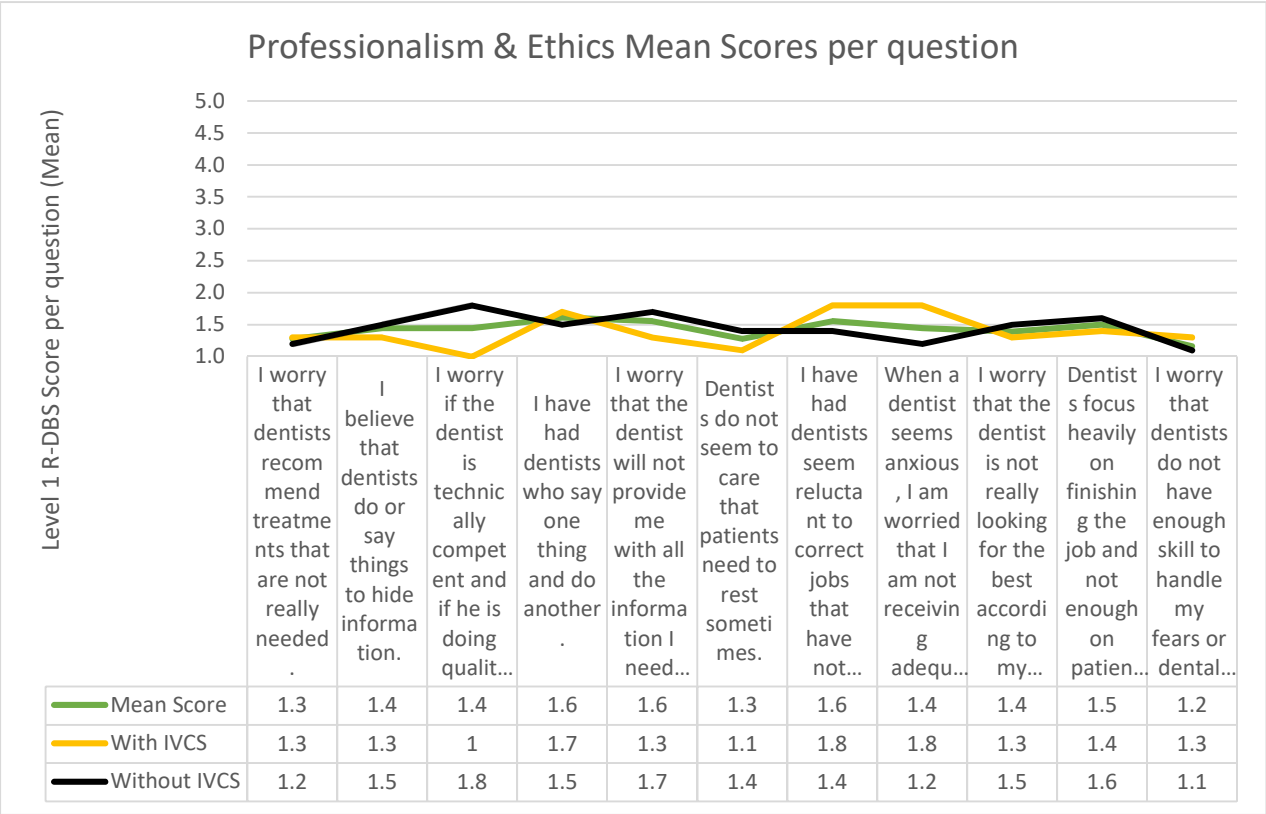


Figure 14 : R-DBS – Level 1 Mean Scores Professionalism & Ethics by question

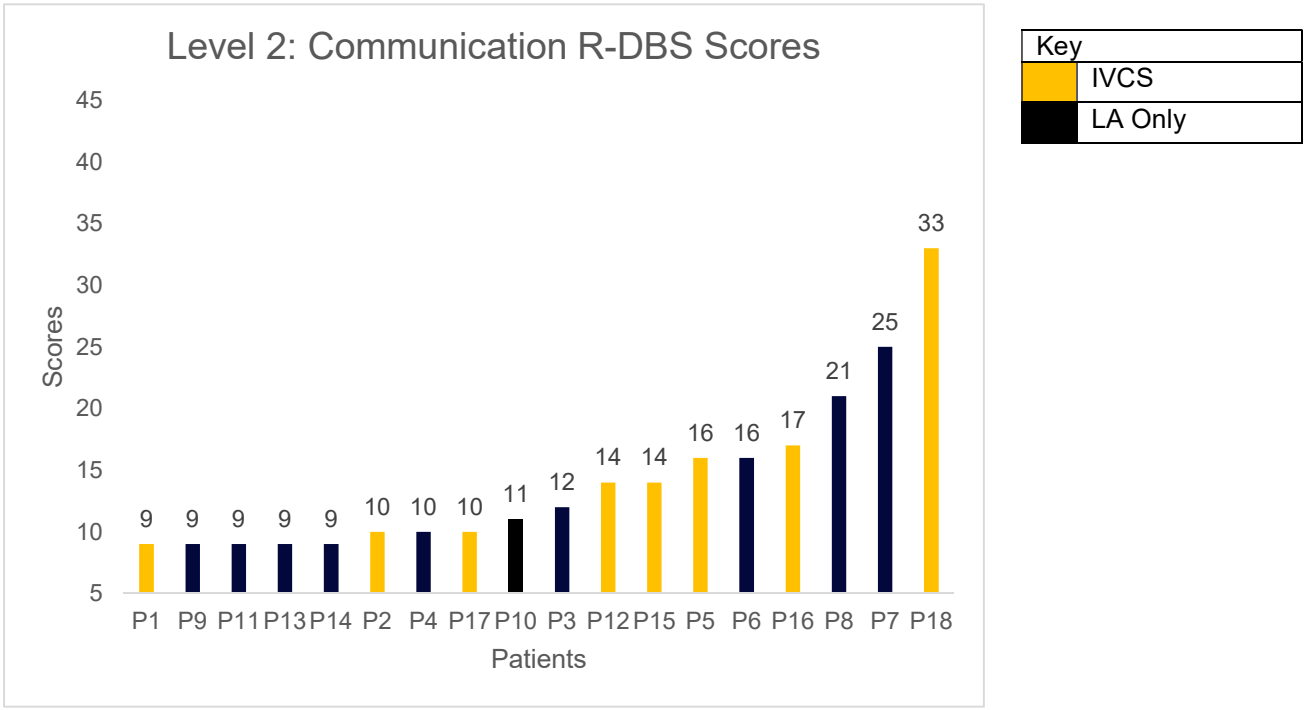
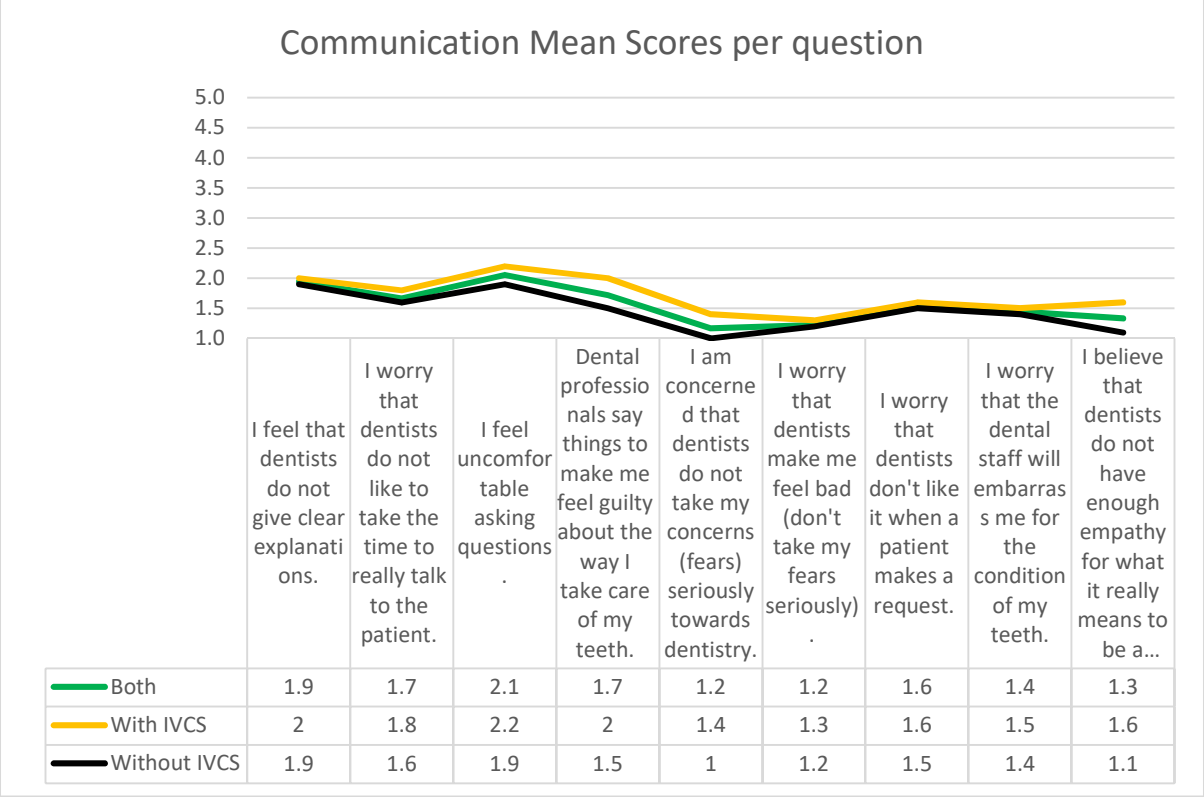


Figure 15 : R-DBS – Level 2 Scores Communication

Level 2 scores, as illustrated in Figure 15, reflect dentists' communication with the patient. The minimum score is 9 (good communication) while the maximum score is 45 (poor communication). The average score was (254/18) 14.1 indicating good communication skills by the dentist. The average score in the sedated group was ((123/8) 15.36 versus the non-sedated group (131/10) 13.1 indicating the non-sedated group felt the dentist had slightly better communication skills. The modal score was 9, indicating across the 9 items, 5 respondents rated dentists with the lowest (and therefore most favorable) score against the communication metrics.



	I feel that dentists do not give clear explanations.	I worry that dentists do not like to take the time to really talk to the patient.	I feel uncomfortable asking questions.	Dental professionals say things to make me feel guilty about the way I take care of my teeth.	I am concerned that dentists do not take my concerns (fears) seriously towards dentistry.	I worry that dentists make me feel bad (don't take my fears seriously).	I worry that dentists don't like it when a patient makes a request.	I worry that the dental staff will embarrass me for the condition of my teeth.	I believe that dentists do not have enough empathy for what it really means to be a...
Both	1.9	1.7	2.1	1.7	1.2	1.2	1.6	1.4	1.3
With IVCS	2	1.8	2.2	2	1.4	1.3	1.6	1.5	1.6
Without IVCS	1.9	1.6	1.9	1.5	1	1.2	1.5	1.4	1.1

Figure 16: R-DBS – Level 2 Mean Scores Communication by question

Figure 16, shows the breakdown of Communication subset questions by mean score. Again there is only a small amount of variance between those having sedation and those respondents who are not. The highest and therefore least favourable area is that of feeling

uncomfortable asking questions (with a mean range of between 1.9 – 2.2). Although not a significantly high score (when compared to a potential score of up to 5) this is the highest of the mean scores per question in the communication subset.

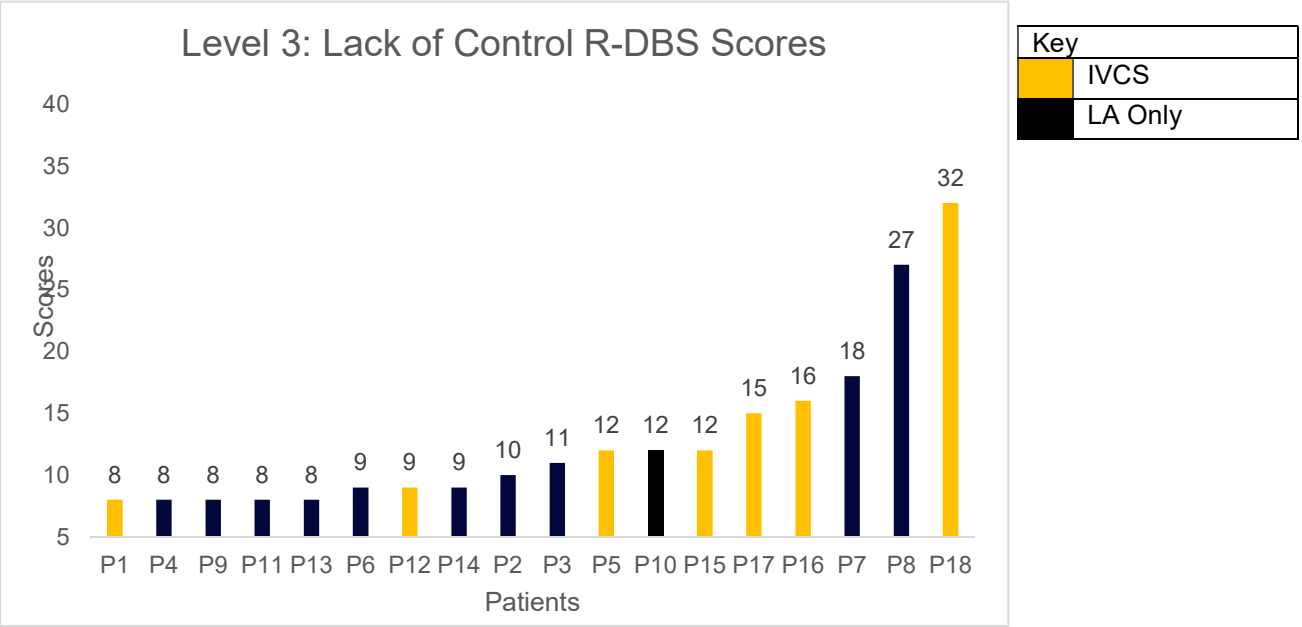
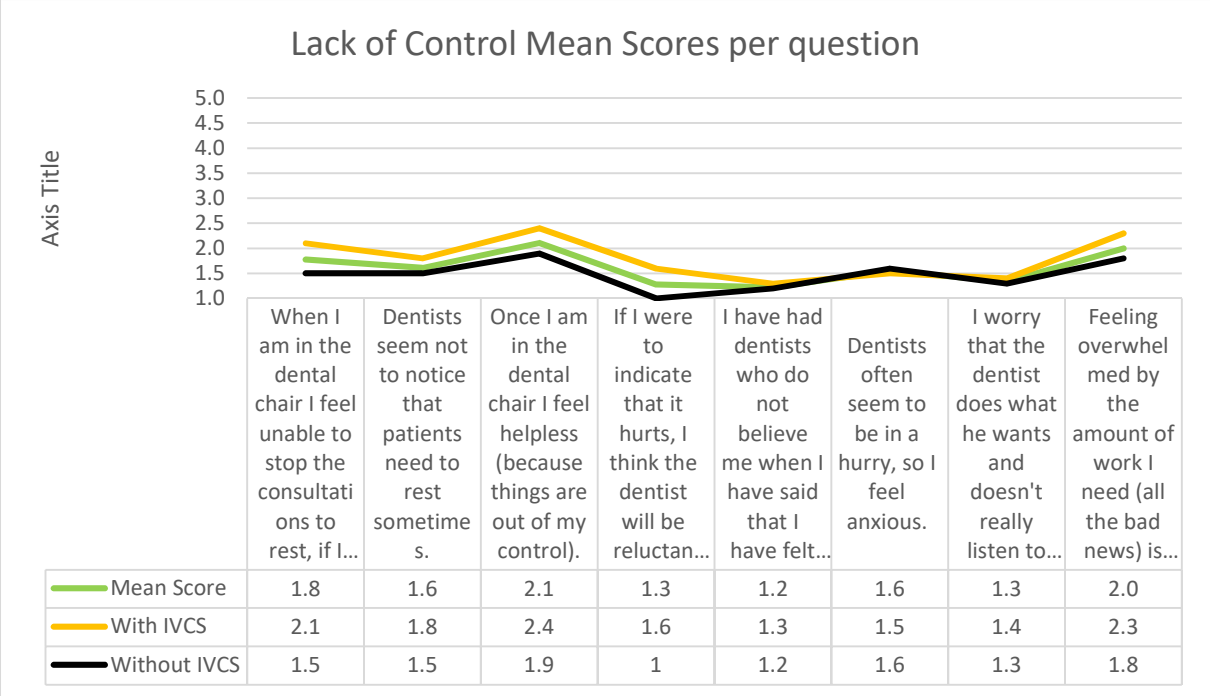


Figure 17 : R-DBS – Level 3 Scores Lack of Control by patient

Figure 17 shows the total level 3 (lack of control) R-DBS by patient and sedated/non sedated. Level 3 scores reflect how in control patients felt at the dentist ranging from 8 (fully in control) to 40 (not in control). The average score for all patients was (232/18) 12.89 indicating that patients felt relatively in control at the dentist. The range of scores was 24, with the modal score at 8. The average score in the sedated group was (114/8) 14.25 versus the non-sedated group (118/10) 11.8 indicating that the non-sedated group felt slightly more in control at the dentist.



	When I am in the dental chair I feel unable to stop the consultations to rest, if I…	Dentists seem not to notice that patients need to rest sometimes.	Once I am in the dental chair I feel helpless (because things are out of my control).	If I were to indicate that it hurts, I think the dentist will be reluctan…	I have had dentists who do not believe me when I have said that I have felt…	Dentists often seem to be in a hurry, so I feel anxious.	I worry that the dentist does what he wants and doesn't really listen to…	Feeling overwhelmed by the amount of work I need (all the bad news) is…
Mean Score	1.8	1.6	2.1	1.3	1.2	1.6	1.3	2.0
With IVCS	2.1	1.8	2.4	1.6	1.3	1.5	1.4	2.3
Without IVCS	1.5	1.5	1.9	1	1.2	1.6	1.3	1.8

Figure 18 : R-DBS Level 3 Scores Loss of Control by question

Figure 18, shows the breakdown of lack of control subset questions by mean score. Again there is only a small amount of variance between those having sedation and those respondents who are not. The highest and therefore least favourable area is that of feeling helpless because ‘things are out of my control’. Although again not a significantly high score (when compared to a potential score of up to 5) this is the highest of the mean scores per question in the both the loss of control subset.

5.5 Thematic Framework

Thematic analysis of the interview transcripts using NVivo software, indicated that identified themes fit appropriately with 3 different time points along the dental implant surgical journey. These time points include; pre-operative, Intra-operative and Post-operative experiences (Fig. 8). Therefore, data and analysis will be categorised to follow the patients experience of the dental implant surgery in chronological order. This will facilitate narration of the patients accounts of the experience in an explicit way. Qualitative interview data will be used in support of the discussion of the themes and subthemes.

Figure 19 : Chronological order of data analysis

To fully support the results, quotes from interview transcripts, which are textual data representative of themes or subthemes will be used. Patients are identified using study code, assigned randomly, in order to preserve anonymity. The patients descriptive will also include their age, gender and whether or not they received IVCS. For example, Patient 1 who is a 24-year-old female and received IVCS will be known as P1, 24, F, IVCS. Conversely Patient 3 who is a 57-year-old male and didn't receive IVCS will simply be known as P3, 57, M. This will facilitate contextualisation of the content of each quote.

5.6 Main Themes

Data will be discussed under the following headings as presented by Figures 9, 10 and 11

Figure 20 : Pre-operative themes

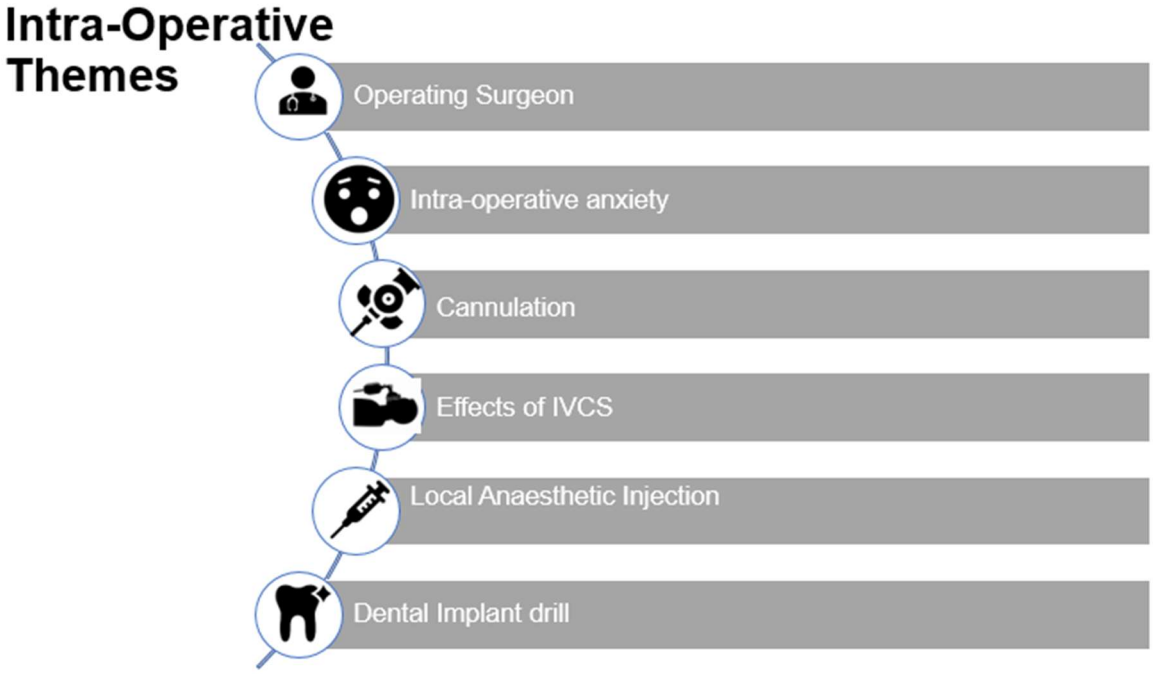


Figure 21 : Intra-operative themes

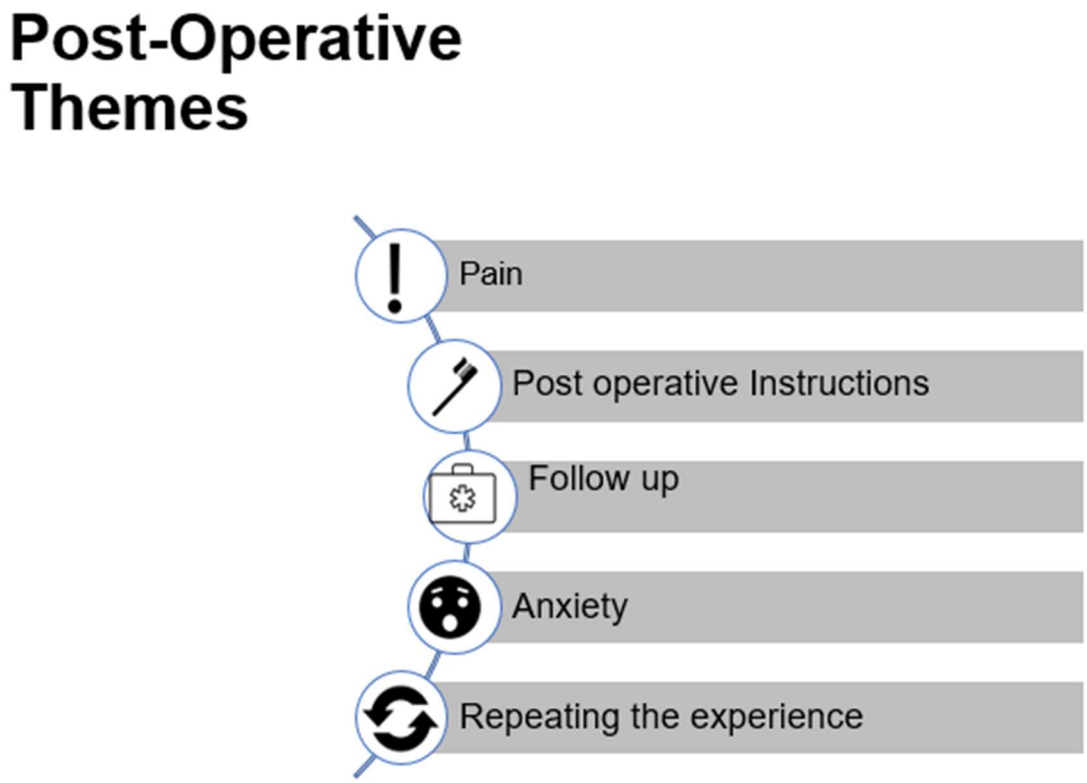


Figure 22 : Post-operative themes

5.7 Pre-Operative

A patient's journey through a course of dental implant treatment commences at the pre-operative period. The pre-operative period is a critical time for the collection and collation of pertinent patient information that is relevant and necessary for any patient scheduled for dental implant surgery. During this period, patients discussed how they lost their teeth and the motivating factors for seeking dental implant treatment. They also discussed their sources of information regarding dental implants as well as factors such as cost, dental tourism and dental anxiety.

5.7.1 Reasons for tooth loss

The majority of patients' narratives discussing their dental implant journey began when they initially lost their teeth, irrespective of the timing or extent of tooth loss. Some patients lost their teeth *'a long time ago, over 25 years ago'* while others had a more recent traumatic event *'I suppose it was nearly 2 years ago … didn't the handle of the brush hit me into the face and it kinda burst my lip and it hit the tooth'* (P10, 56, F).

The participants in this study spoke about the lack of engagement with dental practitioners that had often resulted in teeth being *'eroded and eroded'* until they were forced to seek treatment (P1,24, F, IVCS). Participants tried to avoid any dental treatment until '*it became too unpleasant to tolerate'* (P6, 54, F). Some participants were self-deprecating and admitted to not restoring their teeth earlier and letting them '*go beyond that point, which was my BIGGEST mistake'* (P2, 30, F, IVCS). The reason for this was due to '*an absolute fear of the dentist'* and choosing to let the teeth *'be at the point where it was completely and utterly throbbing'* and so *'getting it pulled would be the last solution'* (P2, 30, F, IVCS).

Failure of dental care was seen from two perspectives. On one hand you had a participant who lost confidence in their dentist due to failed restorative work. This participant originally trusted their dentist to restore her teeth with crowns '*well he said he could do the crowns and I just believed that he could, he seemed okay, he maybe thought he could do them himself'* but he over prepped the teeth and as a result the crowns were unretentive *'he cut them too short so when the teeth came back to be put on top they kept falling out'* (P5, 67, F, IVCS).

However, on the other hand, not all failed restorative work had negative connotations, so long as it stood the test of time *'I've had a Crown on that tooth for years and it just snapped*

off' (P3,57, M). Even for a participant who had *'a crown and I think two or three root canals' with 'constant infection'* did not report being disgruntled about losing the tooth. (P4,64, M)

Participants also considered their lifestyles as another predisposing factor such as a diet full of *'up to 6 cans of Coke a day'.* When this same participant had a baby that didn't sleep she *'started drinking red bull'*. She maintained that the red bull *'dissolved'* her teeth and the coke *'rotted them'* (P2,30, F, IVCS). A further risk factor for tooth loss raised was an eating disorder suffered by one participant whose teeth as a consequence '*disintegrated*' and '*weakened*' (P11, 45, F)

Some patients were emphatic about the fact that they cared for their teeth and were '*the type of person who does look after their teeth'* (P9, 66, F) and '*always had perfect teeth'* (P12, 63, F, IVCS) yet they still managed to lose them. There was an acceptance that '*these things happen. I just have weak teeth so…*' (P1, 24, F, IVCS)

There was a sense of blame amongst patients for the traditional methods that dentists of their generation used. When you *'went to the dentist in school and they just took teeth out you know'* (P9, 66, F) and '*No fillings whatsoever were done-which is an awful shame really*' (P18, 74, M, IVCS). Participants believed that '*traditionally teeth were overfilled*' (P6, 54, F). However, there was a general consensus that these archaic methods that dentists once used have now thankfully evolved and *'that doesn't happen nowadays*' (P18, 74, M, IVCS). There is a feeling that modern dentists now prioritise saving teeth and '*have more foresight'*. Additionally, it is thought that dentists now employ a method of *'planning for the future',* communicating more treatment options and discussing the potential risks associated with treatment. They are also more likely to discuss what will happen if things don't go to plan and *'more of a this is what is going to happen if we don't do that then this will happen'* (P16, 68,

F, IVCS). Participants believe that *'there's definitely more education but also a different approach'* with a greater emphasis on *'preventative work being done'* (P6, 54, F)

5.7.2 Motivations

Once patients had described how they had lost their teeth, they subsequently went on to reveal what lead them to actively seek out dental implants. Motivating factors specifically included functional reason, dissatisfaction with their denture, not wanting a denture, aesthetic, social and psychological reasons as well as the outcome of the referral.

Participants were conscious of the fact that *'when you get older your other teeth could give you issues' and therefore one must 'stay on top of it'* (P14, 55, M). For some patients, the primary reason for seeking dental implant treatment was due to an adverse attitude towards dentures. Participants *'just hate the idea of having to take something in and out' (P13, 50, F)*. When patients were asked how they would feel if dental implants weren't an option, the response was catastrophic *'God if the implant fails I don't know what I'll do. That's a very bleak outlook if it fails'* (P6, 54, F)

Functional reasons with respect to the ability to continue with usual activities such as chewing food and the ability to *'maintain a decent set of chewing teeth'* were a priority for participants.

Patients were extremely dissatisfied with the function of their current denture. They were unable to carry out essential daily activities which had significant impact on the patients' oral health and quality of life. The impact of a lower than satisfactory function meant that patients *'couldn't eat or nothing, nothing whatsoever, you couldn't even drink, they were very awkward, they were falling out and they were just annoying me'.* The social impairment

caused by the denture instability could not be underestimated *'you couldn't do nothing you couldn't even talk to people'* (P15, 72, M IVCS)

Patients associated having a denture with older age, something which they found hard to cope with emotionally. They associated this transition to being *'VERY OLD'*. This alteration in self-imagine was compounded by the fact that the same participant felt that people who wear dentures are targeted as a source of *'toilet humour and false teeth jokes'* (P16, 68, F, IVCS)

The aesthetics of the denture were a source of consternation and caused patients to '*hate myself in photos because when I smile, where the denture is up further and it looks like I have crooked teeth'* (P12, 63, F, IVCS). Some participants received dentures as a temporary prosthesis after their teeth were extracted while waiting for healing to occur before the implant placement. This period usually lasted between 3 and 6 months. Participants did not tolerate this temporary denture well

'Oh I hate it! God I hate it. I can't tell you how much I hate it…its awkward to eat, it's horrible. I don't know how people live with them…I was very self-conscious of it in the beginning. I found it big in my mouth. It's very unpleasant altogether and I can't wait to go home and take it out' (P6, 54, F).

When one participant received her denture initially she felt that she couldn't speak at first and that she was *'nervous of it'*. She likened the feeling to being similar to receiving a local anaesthetic and felt they' *were taking funny'* (P10, 56, F). This was echoed by further participants who felt they had '*a lisp all the time'* (P13, 50, F)

Participants felt a sense of shame and stigma attached to wearing a denture and they *'did not want people knowing'* (P16, 68, F, IVCS).

These feelings certainly motivated patients to consider dental implants and as previously mentioned was the fundamental reason *'why I decided to get the implant'* (P10, 56, F).

Regardless of the degree of tooth loss or the age of the patient, most patients felt a sense of humiliation and indignity attached to having a gap. One participant felt *'like somebody from a disadvantaged area or something'.* There was a belief that it is socially unacceptable in a younger age group to be missing teeth *'Because you know it's not very common in my age group that you'd have no teeth like'* (P2, 30, F, IVCS).

The aesthetics of this gap (after the tooth was extracted) made one patient '*completely conscious'* which led her to have '*no confidence within myself*'. For the same participant *'it definitely, definitely changed my whole personality and how I felt about myself'.* It affected her psychologically and socially and *'prevented me from really going out. Because I didn't want to go out with my friends. I didn't want to… like I actually wouldn't speak in public for a long time or I was very, very quiet. And before that I wasn't'* (8, 19, F)

Another motivating factor was the outcome of the referral. Patients felt '*delighted to be going to the dental hospital'* (P5, 67, F, IVCS). They believed that because the dental hospital is an academic institution that '*teaches people, well in any field I'd be drawn to that!'* (P16, 68, F, IVCS). Interestingly patients '*prefer to go somewhere not too fancy'.* There was a perceived conception that opulent, state of the art dental clinics can be associated with exorbitant costs. Patients were perturbed by this and felt a sense of distrust in private clinics. They believed that some clinics *'were adding in a lot of extras… without informing me'* (P8, 19, F). Conversely, they held the dental hospital in high regard and considered it as a place that provides honest and ethical care.

5.7.3 Provision of Information

Dental implants are becoming increasingly ubiquitous in modern day society coupled with an increased demand and awareness of this type of tooth replacement. The majority of the study participants acquired beliefs about dental implants could be summarised as *''implants are the way to go aren't they really?''* (P9, 66, F). Patients' were asked about what they expected the dental implant surgery to entail, the types of information they did or didn't receive and whether or not the patients engaged with this information.

In-depth discussions with patients regarding sources of information about dental implants identified several key areas. Specifically, these were clinically based information from their general dental practitioner (GDP) or the implant surgeon and informal sources such as family, advertising and the internet.

For the majority of patients' referral to have dental implants was instigated by the patients' general dental practitioner (GDP) due to skill or practice limitations. There was a sense of paternal deference as patients tended '*not to bother researching'* about dental implants and left it completely in the hands of the clinician 'if *he tells me that they're good I'm happy that they're good'* (P11, 45, F). Participants believed that *'a good relationship with your dentist'* meant participants could *'rely on the information you'd be getting from the dentist'* (P10, 56, F). Some patients *'really do trust'* that their GDP would not *'put me through something that I don't need'* (P11, 45, F). They would prefer to *'leave it up to the clinician'* to decide what the best treatment option for them including referring them for implant treatment.

'*…as I say my dentist with whom I have been with for over 30 years told me that that's the thing to do'* (P3, 57, M).

Although the GDP was the source of the referral, the information provided to patients about dental implants was relatively limited. Patients knew that they had been referred for dental implant surgery and they '*waited for my appointment with PS. I didn't undertake any research in it*' (P4, 64, M). As previously stated 'PS' is the dental implant surgeon. They were more concerned about the operator as opposed to the surgery itself '*Well no, I trusted J (GDP) was referring me to the right man and so I didn't need to check him out'* (P18, 74, M, IVCS).

Informal sources of information included friends and family members or through '*word of mouth-ha-ha pardon the pun'* (P16, 68, F, IVCS). Interestingly, some patients did not seem to know many people who had received dental implants '*But you see I don't know of anyone else, no locals here or relations here have ever gotten an implant*' (P10, 56, F)

Patients didn't seem to discuss getting their implant done with others ''*Which is a bit unusual actually because normally I would be inclined to do that'* (P3, 57, M)

Those patients' that did discuss their implant treatment with family members were influenced both positively and negatively by them. Some family members encouraged patients to get dental implants and acted as the patients first source of information regarding them *'because a friend of mine had them, she was the first person I knew who got them done'* (P16, 68, F, IVCS). Conversely, some family members were '*totally against it*' (P15, 72, M, IVCS) and believed that the participant would not be able to tolerate the procedure. They recalled how family members enquired if they were *'sure that you want to go through with that'* (P10, 56, F) when it came to undertaking dental implant surgery.

Although most patients preferred waiting for information from the clinician, the patients that did search the internet had mixed thoughts on it. Some participants found the internet helpful '*I had kind of googled it or whatever so I know that it's a titanium screw and they pull back*

the gum and stitch it back up with some stitches and that' (P2, 30, F, IVCS). They were able to see '*a small description and an image of it* (the implant)*, what it is and how it works… and how it bonds onto the bone'* (P4, 64, M). One participant felt a sense of embarrassment about using '*Dr Google-that's probably a bad answer'* (P1, 24, F, IVCS)

But for the majority of patients, they believed that using the internet was not advisable and caused more harm than good. They believed that the internet would just provide some '*scare mongering story'* or a *'horror story'* (P11, 45, F)

Patients had *'personally seen Mr and Mrs Google do so much harm'* whereby they have had friends who *'ignore their own Doctors advice'* because of the internet leaving them with *'fewer choices'* (P16, 68, F, IVCS). Patients were emphatic about the fact that the internet is full of misinformation which categorically has to be trumped by expert medical opinion.

'When you google something you don't know what is going to come up' (P18, 74, M, IVCS) *'if you could just get a proper medical opinion it would be a lot more balanced*' (P14, 55, M)

Patients had first-hand experience of looking up other surgeries in the past and were *'so sorry that I did. Because I was a nervous wreck then. And I just thought I'm going to a professional, they know what they're doing, sometimes you can just scare yourself a bit*' (P13, 50, F)

Conversely, some participants expected the surgery to be so straight forward that it didn't warrant investigation. They justified not needing to look things up on the internet because 'I *just kinda felt oh look he's going to screw in a few things and they'll be grand*' (P12, 63, F)

Some patients first came across dental implants through the Television and celebrity influences. *'I'd say it would have been media throughout the years. Probably newspapers and that sort of thing. That's where I would have come across them'* (P14, 55, M)

When patients were asked, what they were specifically told the implant surgery would entail, only one patient, who happened to be an engineer, could describe it in detail.

'he explained it in probably 60 seconds like you know. You know you drill a hole and you go down about 10mm and you put in an insert and you compress the insert and it will take about 3 months for it to grow onto the bone. That's about it like' (P4, 64, M)

Interestingly, it became obvious that the patients included in this study were actually not adequately informed, even after they had gone for their implant consultation. There was continuous uncertainty when describing dental implants and confusion regarding the treatment process. Some patients thought that the implant and crown could just be placed in one go. They did not realise that they had to have a separate restoration appointment that was undertaken elsewhere.

Often patients attended the dental implant surgery appointment thinking they were going to leave the appointment with a tooth, only to be bitterly disappointed *'In my head I thought the tooth was going in the last day but sure it couldn't have been as we were only putting in the base for it. But that was wishful thinking more on my part'* (P11, 45, F)

Patients did not think *'that it was going to be so much work'.* They believed that *'they'd just screw the tooth in and it would be done straight away. I didn't know about everything that was needed to go before hand'* (P8, 19, F)

There was obvious confusion regarding the procedural steps involved.

'I wasn't actually sure like the last day I thought I was going to walk out with a tooth actually on the day. I wasn't entirely sure, so I'm a bit vague on that to be honest to say the least' (P14, 55, M)

There was further discrepancy regarding the distinction between the operating surgeon and the restorative dentist. They did not seem to know who was going to be responsible for carrying out the procedure *'And then he said he (GDP) wanted to send me to the dental hospital and I wasn't really sure what was happening?'* (P5, 67, F, IVCS)

Patients concluded that not getting the crown and the implant together was disruptive and inconvenient for the patient. *'You see then there's no continuity really for the patient. That break in continuity I find a bit worrying'* (P12, 68, F, IVCS) and it added further confusion to the treatment chain.

Additionally, patients were surprised when it was mentioned that they needed a bone graft prior to the placement of the dental implants. Patients felt uneasy about this.

'But then when I said about the bone grafting, even my daughter that's a nurse didn't think I'd be up to it' (P10, 56, F)

Patient did not receive any written information about what the dental implant surgery entailed. They asserted that you should receive written information but also that it cannot compensate for the *'consultant' who 'should give the information'* at the consultation appointment (P3, 57, M). The lack of written information given to patients was concerning for the lead investigator as they were aware of written information leaflets that exist. Unfortunately, they just were not physically handed to the patient.

Patients recognised the advantages of written information '*just a recap thing*' (P18, 74, M, IVCS) which would allow them to recall information when needed at a later date or to help them to share their decision about embarking on dental implant surgery with their family and friends. *'I'd prefer a leaflet because then I can bring it home and show it to somebody else to*

make sure. Because if somebody tells me I forget bits and if I watch something I'll also forget bits' (P8, 19, F)

When patients were asked if they had enough information or did they want a more in depth account of what the implant surgery entailed, the answers were diverse. Some patients were unsure because they felt knowing too much or too little was *'a catch 22'* (P2, 30, F, IVCS). Some patients would '*prefer not to know*' as this would *'probably only terrify me even more'* (P17, 58, F, IVCS)

Patients felt that if you knew about all the risks involved '*you can get too nervous'* (P5, 67, F, IVCS) but at the same time intra-operatively if something unexpected happened *'I'd be like oh no what's that!'* (P2, 30, F, IVCS)

A measured approach entailed only knowing '*the things in which I needed to know in order to assess whether I should go ahead or not. So in other words if there were risk factors I would want to know what they are'* (P3, 57, M)

Some participants felt that they were not prepared for the surgery and expected more pre-operative information about *'every step of the way really'.* They felt that the operator should have spent more time before hand telling patients about what to expect *'What is good, what is bad about it and what problems could arise' (P18, 74, M, IVCS).*

Patients recalled that usually when it came to other surgeries, they would make enquiries and speak to other people who had it done, but realised they had not done this when it came to dental implants '*Usually I would try and ask people. Interestingly I don't think I did that enough during this process. It's funny now'* (P6, 54, F).

The lack of information regarding dental implants transcended through to the lack of information patients were given about IVCS. Again most patients employed paternal deference and felt that if they had needed sedation they would have been offered it.

'I kinda left it up to PS, he knew what he was doing. If he thought I needed it he would have given it to me' (P7, 63, F).

When the lead investigator spoke to patients who were about to have sedation before their dental implant surgery, some patients had no idea how the sedation was going to be delivered. They did not know if it going to be intravenous '*through the vein? or* inhalation is *'it a mask?'* (P1, 24, F, IVCS) or if it was going to be oral sedation '*with tablets'* (P2, 30, F, IVCS).

The only thing that patients seemed to be told was *'that I wouldn't remember anything, I would be conscious but I wouldn't remember it afterwards so that was kind of good news you know'* (P17, 58, F, IVCS).

Most patients who were sedated, took the recommendation from the consultant to have it. Again they trusted in whatever the consultant advised. They didn't *'care how it was done, so long as it was done'* (P17, 58, IVCS, F)

Some participants were surprised that some patients would not opt to have the surgery done under IVCS *'how is that an option? How could you say no? I was just amazed that some people must say no to that?*' (P16, 68, F, IVCS).

Some patients did ask for sedation specifically due to pre-operative anxiety *'I said I'd be afraid of the noise and in case I'd faint' (P15, 72, M, IVCS).* For some the participants *'that's the only thing I was concerned about'* (P17, 58, F, IVCS)

Participants felt that IVCS was a good alternative to a general anaesthetic in which they would feel *'the dangers of that a lot more'* (P16, 68, F, IVCS)

Patients who didn't have sedation could understand why some people would opt for it. Patients who were *'good at the dentist'* didn't feel they needed it but they understood that *'for a person that wouldn't be it would be a good idea. I'd say that if you weren't relaxed, if you were very anxious or didn't like going to the dentist. I'd say you'd definitely need something to relax you'* (P10, 56, F).

Some patients revealed why they would not opt for sedation. They were averse to it because *'the sedation it can make me feel a little bit sick'* (P11, 45, F) and that even if she was getting a scope *'I've had them awake and I will swallow that camera down fine'* (P11, 45, F).

Other reasons for not wanting the sedation was due to the '*disruption of it. You know, it takes longer, a bigger ordeal I imagine'* (P6, 54, F)

They felt that *'The amnesic effect can be good and bad but it is problematic to have. I would avoid it if possible'* (P6, 54, F)

In fact, one patient believed that IVCS *'probably makes it easier for the medical practitioner to get on with it in some cases. More than for the Patient'* (P4, 64, M).

5.7.4 Cost

There are three main costs involved when considering dental implants. The dental implant surgery, the dental implant restoration and the time taken off work to get the treatment completed. There was a general consensus that dental implants are '*Expensive…in one word!*' (P9, 66, F). It is not surprising therefore that a large proportion of the interviewees were retired '*If I had lots of money I'd have had it done years ago'* (P7, 63, F).

Confusion regarding the treatment plan naturally led to confusion regarding the cost of dental implants *'I didn't know just how much expense they were going to be at the start*' (P8, 19, F). This is due to the fact that the dental implant surgery '*the first cost is only part of it*' (P7, 63, F). Patients felt that '*it probably would have been better if I had been quoted a price for the full thing'* (P16, 68, F, IVCS) at the initial consultation, quoting both the cost for the dental implant surgery and the restoration. This lack of clarity is down to poor communication between the dental implant surgeon and the restoring dentist.

Both parties have a responsibility to ensure that the patient is well informed about the total cost of the procedure from start to finish. Other patients '*had an assumption about the payment plan'* and were not *'prepared when I was asked for payment'* (P6, 54, F)

Discussing costs with participants in any field can have negative connotations, but especially in relation to dentistry where patients feel that '*Dentists in general are too expensive in my view for what they do… by the time I'll be finished, my bank account will be empty'* (P7, 63, F)

Patients felt that costs involved were the main barrier to patients' receiving dental implants and knew people that couldn't afford them. Many patients found this distressing and '*SO hard to hear'* (P16, 68, F, IVCS) and these perceptions where others considered dental implants '*so expensive'* led participants feeling a sense of guilt which caused them to keep their dental implant treatment a secret.

'I haven't told anybody outside of my family that I'm having this done… Like you know sometimes when people get their teeth done and other people comment on them. And they comment on how much they cost and sometimes it's not a complimentary thing sometimes? (P12, 63, F, IVCS).

Furthermore, patients felt they had to justify spending this money on themselves '*I wouldn't normally spend that kind of money you know it's a huge thing for me you know…spending this money on myself!!'* (P12, 63, F, IVCS). Interestingly, these feelings were only shared amongst the female participants.

Others felt that '*if you want it you'd do without something to save the money towards it, if you really want the implant done'* (P10, 56, F). Irrespective of the cost patients felt that '*It's something I want done and I'm just going to do it!'* (P9, 66, F). That it is worth spending this money on themselves '*And I say yeah but it's for me and I've put it off now long enough at this stage'* (P1, 24, F, IVCS)

Patients felt that if they restored the functionality of their mouth and '*if you're able to eat, I don't care, you know. It may be money well spent thank god'* (15, 72, M, IVCS)

Many patients felt that the costs of dental implants are justified. They are seen as the '*latest technology'* for replacing teeth. And *'if you look at it long term if it works'* it ends up being more cost effective than repeated crowns or other failed restorative work. Patients '*expected it to be expensive'* and again felt the costs were justified *'by the level of expertise and experience and back up which goes with getting it done locally'* Some patients were *'prepared to swallow'* (P3, 57, M) those costs involved. Ultimately, '*At the end of the day the credentials of the operating dental surgeon in this case is pretty paramount I think rather than the cost*' (P4, 64, M)

5.7.5 Dental Tourism

The high cost of dental implants led the chief investigator to explore how patients felt about going abroad to receive dental implants at a much reduced cost. There was a general

consensus that cost was the primary reason why 'people are going out foreign' as participants believed the cost in Ireland were out of reach for some as people. 'can't afford' implants (P7, 63, F) Advertisements about '*going to Hungary and other far flung places'* is how some patients first encountered the idea of dental implants (P3, 57, M)

Most patients felt that going abroad to have treatment done was undoubtedly '*a very high risk thing to do'* (P6, 54, F). The risk of the surgery itself and '*if it legit'* (P9, 66, F).

The ambiguity around the timeframe *and 'how you can get them done so quickly and so cheaply it sounds just absolutely horrible you know.* (P9, 66, F)

But overwhelmingly the risk of not having any follow up *'if something goes wrong who wants to touch somebody else's bad work'* (P2, 30, F, IVCS). Patients would prefer to have the '*security of having back up' (P6, 53, F) and 'if something went wrong, to be able to go into town and get it sorted. So I wouldn't even consider it*' (P16, 68, F). They would also prefer to have their dental implants placed where they would know '*peoples' reputation'* (P13, 50, F)

Patients felt that due to experiencing the dental implant journey '*Now knowing what I know I just wouldn't dream of it'.* They felt that *'There is just too much risk involved altogether. You know its madness!'* (P3, 57, M) and that if they couldn't afford the treatment in Ireland they would '*rather go without' (P2, 30, F, IVCS)*

Some patients felt that they '*wouldn't have the confidence to do it actually' (P6, 54, F), that they would be 'too scared' (P16, 68, F).* There was a perception therefore, that going abroad for treatment was something they may have considered '*maybe if I was younger I would have gone that way'* (P10, 56, F)

They felt that younger people are less medically compromised '*I'm a type 1 diabetic'* (P13, 50, F) and therefore better able to cope with the travel, the inconvenience and the consequences of dental implant failure.

Participants could '*understand people doing it' (P6, 64, F)* as dental implants are *'not affordable in Ireland*' and some people have no other options. They appreciated that they were in the privileged position of not having to do it.

That being said, patients did have a rationalised approach to the cost/benefit ratio of going abroad for dental implants. Patients felt that '*in a sense you know the cost of it would be similar to Ireland probably by the time you take a couple of days off work' (P4, 64, M)* Ultimately by the time you had paid for *the flights, the hotel, the recovery, I presume you end up paying the same amount'* (P17, 58, F, IVCS). Time is money and patients felt that they '*wouldn't have the time, like an implant is too long, you'd have to go out a few times-so that wouldn't suit me'* (P7, 63, F)

And very simply, some patients do not like to travel.

'*Going out foreign? Jesus would you stop. No way. I'm not a man for travelling anyways'.* (P15, 72, M)

5.7.6 Anxiety

Anxiety in the pre-operative period was twofold: patients who had dental anxiety based on negative childhood experiences or patients who had anxiety regarding the intra-operative period or the outcome of the dental implant procedure. It was interesting to note that 6 of the 18 patients interviewed recall traumatising childhood experiences at the dentist. Five of those 6 patients had IVCS.

In relation to negative childhood experiences, one participant recalled going to the dentist to get their tooth out as a child *', being sedated and screaming'.* Patients hold responsible these childhood experiences as having '*a lasting effect'.* This was not only her negative experience, but her mothers' continuous account of that day when she recounts how she heard '*the screaming down the corridor'.* (P17, 58, F, IVCS)

Patients felt victimised by the dentist at the time *'All of them were taken out, they shouldn't have been taken out at all… it was a disgrace'* and referred to the dentist as *'the butcher'* (P15, 72, M, IVCS)

Patients recalled negative sensation experiences with *'drilling and not enough injection into the gums or maybe incorrectly done'* (P18, 74, M, IVCS).

Patients gave accounts of local anaesthetic not being used *'they didn't freeze anything' …* either because *'the anaesthetic hadn't been invented or they didn't know how to use it'* Patients felt that school dentists *'were butchers so from that point of view'* (P4, 64, M).

The sensation of *'touching a nerve'* was terrifying for patients. (P12, 63, F, IVCS).

Some patients *'just have an absolute fear of the dentist'* and would leave their teeth get to a *'point where it was completely and utterly throbbing. And then I know that getting it pulled would be the last solution'* (P2, 30, F, IVCS)

In relation to the thoughts of the intra-operative procedure, the '*not knowing'* (P5, 67, F, IVCS) what was ahead of them was a significant issue for these patients. Patients weren't sure '*whether it was just a regular dental type of thing I was going to feel or not'* (P14, 55, M)

Any patient that had a bone graft would have felt an increased anxiety about that rather than the implant surgery. *'I mean I was really nervous before the operation of the bone graft. I was*

petrified of that really. I don't know why I was pretty afraid of it' (P12, 63, F, IVCS)

Some patients felt that anxiety was a normal part of the process. They felt that you should just *'want to get on with it and hopefully everything will be fine'*. And that *'most people are a bit nervous really…*' (P5, 67, F, IVCS)

There was a perception that '*If you want to feel pain you will!' and that 'if you have a fear of something, the slightest bit of discomfort would magnify the pain'* Where as if you just accept that *'it's going to hurt a little bit but in a couple of weeks' time it will be gone or a couple of hours you get on with it!'* (P4, 64, M)

Interestingly, 1 of the patients that had IVCS didn't have a bad dental experience but a bad cannulation experience. This occurred in hospital when '*nobody could find a vein and then they got this male doctor*' who didn't find the vein either but *'stuck it into my arm and then when I went home my arm was sore for a whole month. And it was black and blue and I could barely move it'* This patient felt that this doctor was *'only showing off and I had to suffer… all for his ego'* (P5, 67, F, IVCS). Nevertheless, the patient did not have any anxiety about future cannulations '*No, that wouldn't have put me off*'.

5.8 Intra-operative

The intra-operative period commences once the patient enters the dental surgery and is completed once the patient is discharged. During this period the patient had their dental implants placed, by the same operator, either with or without IVCS. Both cohorts of patients discussed the operating surgeon and anxiety. Those who had IVCS discussed the cannulation experience and the effects of the IVCS. Those who had LA only discussed the LA injection and the dental implant drill.

5.8.1 Operating surgeon

All the dental implants and bone grafts were placed by the same consultant oral and maxillofacial surgeon. This consultant has been placing dental implants for more than 25 years and is highly experienced in this area. The rapport and trust that the operating surgeon established with the patients had a major impact on their treatment experience.

This rapport commenced at the consultation appointment which patients observed was '*very friendly, I mean it was particularly friendly'* (P16, 68, F, IVCS). Patients '*knew that when I walked into the room I thought I'm in good hands'* (P1, 24, F, IVCS)

Patients felt completely at ease and were '*bowled over and it was just so easy to ask questions because of his manner'* (P16, 68, F, IVCS). For them he had created a safe, non-threatening environment '*that made me relax immediately. It was like having a nice cup of tea with somebody'* (P16, 68, F, IVCS).

His '*really relaxed' (P1, 24, F, IVCS)*, '*very easy going'* (P3, 57, M) *'hugely professional' (P14, 55, M) 'very approachable'* (P12, 63, F, IVCS) and '*pleasant'* (P3, 57, M) nature *coupled with an 'air of confidence'* (P14, 55, M) was particularly apparent and encouraging for patients '*he has a kind of a warmth that I just warmed to' (P16, 68, F, IVCS)*.

They felt that he struck the right balance between talking and listening '*He is just right, he's not too much and he's not too quiet*. They believed he '*gives you confidence and security. I just trusted him'* (P12, 63, F, IVCS)

Patients also described the operating surgeon as a good team leader who inspires confidence in his team and '*that if you have a good leader, then you have a good team... It works from the top down… if you had someone who was arrogant that would have changed things'*. (P11, 45, F)

He was frequently described as warm, confident, experienced, professional, jolly and easy going. The patients' thoughts on the operating surgeon can be summed up in the statement '*I think he's fabulous. I think the confidence he inspires is just incredible' (P13, 50, F)*

While the dental implants were being placed, patients felt very safe '*I didn't feel at risk or under threat or anxious'* (P11, 45, F). They felt that the operating surgeons' wealth of experience instilled great confidence in them intraoperatively '*Because I would feel that he's done this so many times before and he just knows what he's doing, been there, done that you know'* (P3, 57, M)

There was a huge appreciation of the operating surgeons experience *'Like he's there a long time so I was feeling that the risk was, I won't say non-existent but probably minimal'* (P4, 64, M)

Ultimately, patients believed that the most crucial factor to a good intra-operative experience was *'that you have confidence in the person that's doing the job'* (P3, 57, M)

Even when patients were dissatisfied with the outcome, they tended not to complain. This was almost certainly influenced by the rapport established with the operating surgeon. Any criticism was immediately revoked '*By the way I'm quite satisfied with how this worked out so I do understand that everything has a bit of risk involved and it's not a big deal with me…I can whistle and that's all that matters'* (P3, 57, M). This patient described feeling paraesthesia after the bone graft. He states that this risk was not emphasised at the consultation appointment but nevertheless he is quite satisfied.

5.8.2 Intra-operative anxiety

The intra-operative anxiety differed considerably between patients' who had LA only and those that had IVCS.

Those with LA only recalled being very nervous '*when I came in the room and people are getting stuff ready and I was just lying in the chair*' (P8, 19, F)They were amazed '*at how apprehensive I was when I actually sat in the chair'* (P9, 66, F)*y* There was an impeding sense of doom *'that something was going to happen now and it's going to hurt'* Patients felt helpless as if *'there was nothing I could do and I was just trapped in that chair*' (P8, 19, F) They didn't feel in control and that '*I'm here now and I can't go away. I'm stuck with it'* (P9, 66, F)

For many patients this apprehension came from a fear of the unknown '*it's just that I didn't know what was going to be happening you know*' (P9, 66, F) They were not normally anxious at the dentist because '*when you're going in for a filling, you know what's going to happen'*

One participant felt that if she saw the actual implant *'the little screw'* before it was inserted, this would have alleviated her anxiety (P9, 66, F) A coping mechanism for another patient was '*to turn my palms up and breath in'* (P13, 50, F)

Contrary to this, for those who received IVCS, they recalled being less nervous actually entering the surgery as they knew they were going to be sedated.

5.8.3 Cannulation

In order to administer the IVCS, patients are cannulated using a cannula '*little yoke'* into a vein on either the dorsum hand '*on the back of my hand'* or the antecubital fossa (P12, 63, F, IVCS). Midazolam is then titrated incrementally until the patient is sufficiently sedated.

The cannulation process did not seem to cause any sense of disquietude. Patients' categorized it as being *'Just the pinch but sure you'd expect that it's like just getting your bloods done'* (P1, 24, F, IVCS). This familiarity with cannulation '*after having 3 babies I'm used to that sort of a thing'* (P2, 30, F, IVCS) highlight how adaptable patients' are at enduring an uncomfortable procedure.

Patients '*sensed the needle going in' but* knew what was to be expected '*I knew it was going to be a pinch*' (P1, 24, F, IVCS)

Responses like '*I hardly felt it'* (P16, 68, F, IVCS) and '*it didn't hurt or anything'* (P18, 74, M, IVCS) reflect the lack of lack of irritation the cannulation process caused.

Patients' recalled the atmosphere as being '*very relaxed'* and informal with *'chat'* and '*a little bit of banter'* (P16, 68, F, IVCS)

The last memories for patients before the sedation took effect included questions such as *'do people say funny things?' (P16, 68, F, IVCS)* or '*how can I keep my mouth open if I'm asleep?*' (P17, 58, F, IVCS). Patients also recalled explanations that the sedation would be titrated like *'an ongoing drip thing that they would be topping me up (P17, 58, F, IVCS)*.

Patients' recalled the final moments before the sedation took effect as being akin to going '*off to sleep'* (P5, 67, F, IVCS)

5.8.4 Effects of the IVCS

The effects of the IVCS ranged from broadly neutral to extremely positive with no mention of any sensory discomfort throughout the procedure. When asked about concerns about the sedation the main concern for some patients was '*would I be able to keep my jaw open for*

that long period of time?... I was afraid that my jaw would get locked from having it open for so long' (P16, 68, F, IVCS)

Patients felt the effects of the IVCS almost instantly '*within a couple of seconds'* (P1, 24, F, IVCS).

Patients' described the commencement of the effects of the sedation as being similar to '*fighting sleep'* (P1, 24, F, IVCS) and were surprised at how quickly it happened '*I didn't even know I was gone'* (P2, 30, F, IVCS)

Patients thought that these amnesic effects of the sedation were extremely advantageous. One patient said that she felt and remembered *'ABSOLUTELY NOTHING. Great isn't the word for it'* (P16, 68, F, IVCS) This was echoed throughout the interviews *'no, nothing, no sensation no nothing, I was delighted'* (P17, 58, F, IVCS)

Patients were surprised as they '*thought I'd be more conscious'* because they felt they were '*actually unconscious' (P2, 30, F, IVCS).* They expected to be '*very relaxed'* but still *'be aware of what they were doing'* (P12, 63, F, IVCS).

The amnesic effects of the IVCS were obvious throughout the interviews. Patients couldn't remember getting the local anaesthetic injection into their mouth. This was echoed throughout the interviews, when participants only realised this when the lead investigator asked the question which made them make the connection and recalling their mouth being '*tingly afterwards'* (P1, 24, F, IVCS). *'I didn't even realise there was a needle put into my gum until you just said it there'* (P17, 58, F, IVCS)

They couldn't recall feeling the sensation of the implant drill '*I heard no drills or nothing'* (P1, 24, F, IVCS). One patient joked that when she experienced drilling previously without IVCS it felt like '*your brain is going to fall out' (P1, 24, F, IVCS)*

Patients had no awareness of how much time had passed intra-operatively. They *'thought it would last longer, the operation*' (P15, 72, M, IVCS). There was a general perception that the operator *'must have done it really quickly'* (P12, 63, F, IVCS)

Patients could not believe when the operator told them *'You're done' and I was like 'wow'''* (P1, 24, F, IVCS). In fact, some patients thought that '*it hadn't yet happened'* and the only way they realised that they were finished was when *'I felt the roof of my mouth with my tongue and I could feel stitches'.* They then looked at their watch and realised an hour had passed. *'So that's what I remember, it hadn't happened but then realising it had'* (P17, 58, F, IVCS). Patients' felt that '*I just woke up as if I was coming out of a full anaesthetic'* (P12, 63, F, IVCS). It is easy to understand therefore how some patients can confuse IVCS with a general anaesthetic '*I may as well have had a full general anaesthetic as I didn't feel or know a thing'* (P12, 63, F, IVCS)

The was an overarching general consensus that IVCS had exceed their expectations. *'To be honest, I thought I'd have to go through a lot worse. I thought you'd actually be awake. I was very happy to just wake up and not know what happened in the last hour'* (P5, 67, F, IVCS)

5.8.5 Local anaesthetic injections

For the patients that had the dental implants placed under LA only, they recalled unpleasant experiences namely the local anaesthetic injections and the dental implant drill. As previously mentioned, the sedated group couldn't remember these events. The local anaesthetic injections were not enjoyable '*they're not pretty'* (P11, 45, F)

However, patients accepted that they were '*momentary'* (P14, 55, M) and ultimately ensured that they were comfortable throughout the procedure.

Patients felt that the wearing off of the local anaesthetic was nearly worse than the initial injection. *'I actually find the un-numbing worse than the numbing…. when you're starting to thaw!'* (P11, 45, F)

One patient felt that 'I *don't care how many injections I get'* as long as she didn't feel anything due to '*this awful dread of touching a nerve*' She was adamant that '*I'll put up with them if I thought it would prevent the feeling of pain when a nerve is being touched'* (P12, 63, F, IVCS)

5.8.6 The dental implant drill

As previously mentioned, the sedated group could not remember the dental implant drill.

'Was there a drill yeah? Oh god I hate drills. I'm very nervous about drills' (P15, 72, M, IVCS)

But for the LA only patients, the sensation, '*the vibration'* the *'funny smell'* (P11, 45, F) and the sound of the dental implant drill was very disconcerting.

'Oh yeah, well the drill was horrible. The sound of the drill. And the sound of putting it in. And the sound of taking root was horrible. The sounds were actually awful. And the feeling of the pressure of the Drill-I don't like' (P6, 54, F)

Patients did feel the pressure, vibration and '*rattling'* (P4, 64, M) of the dental implant drill but they felt no pain.

'Well I could obviously hear the drill and I could feel the upward pressure that he had to exert. But there was no nerve pain'. (P3, 57, M)

One patient did feel some pain and described it as '*spikey and sharp'* (P6, 54, F). Others described the sensations as being *'quite mechanical' He* felt the *'Twisting'* of the drill and was aware of*' a crunching sound as if a screw was being screwed into something'*

This patient judged the pain as being less than what he would have felt at previous dental appointments when the pain would cause you to get *'a tear in your eye''* (P14, 55, M).

Another patient felt that '*the actual drilling itself is actually okay' but that* the '*thinking ahead' on* the drilling and the fear about '*what's going to happen… will they hit something, will they hit a nerve'* was the most perturbing part. (P16, 68, F, IVCS). One patient recalled the observation of the scalpel to be unsettling which required him to avert his eyes during the procedure. *'I could feel that he had to incise my gum first before he went drilling and all that…. I saw the instrument in his hand and I just kind of closed my eyes'* (P3, 57, M)

The same patient felt that it is '*better not to say what you're doing'* so the patient avoids visualising it. He recommended '*music playing in the background*' or talking about something other than the procedure as a form of distraction for the patient. (P3, 57, M)

Patients were relieved that the dental implant surgery did not last long. *'It was a very short time, he did it so quickly you know. So I was out before I was in really you know. Just couldn't believe the 2 of them were done so fast*' (P13, 50, F)

5.9 Post-operative

The post-operative period begins immediately after the dental implant surgery and continues after the patient has been discharged. This is also known as the recovery period and it can be a potential source of a multicity of complications. Patients in the post-operative period discussed pain, post-operative instructions, follow up, anxiety and repeating the experience.

5.9.1 Pain

It is generally accepted that following dental implant surgery, the majority of patients will experience mild to moderate pain. The severity of post-operative pain is subjective and it can be related to the amount of dental implants placed as well as patient characteristics such as age and sex.

Overall there wasn't a huge amount of post-operative pain reported and any pain that was reported was well managed with pain relief. There was no difference in the post-operative pain experienced by the LA only group compared to the IVCS group.

Once the local anaesthetic wore off some patients felt *'That long lasting sensation of unpleasant and sore was there and then the pain started a few hours later*' (P6, 54, F) The pain if felt was described as being '*very tender, very sore, very painful'* (P18, 74, M, IVCS). However, this pain subsided after '*several hours and then the pain eased'.* Others described the pain as *'nothing that I can't tolerate'* (P13, 50, F). Patients were generally able to sleep that night but that *'The first few nights I woke up with pain. I was able to get to sleep but the soreness and pain woke me up*' (P6, 54, F)

The pain relief prescribed seemed to be effective at eliminating this pain '*when I started to feel the pain coming on I decided to take the 2 paracetamol. And every time I felt the pain come on I did that and it controlled it completely. So I didn't have any of that throbbing pain or nothing'* (P5, 67, F, IVCS). For the majority of patients, by the second day post-operatively '*the pain had eased completely so I decided to come off the pain relief altogether' (P18, 74, M, IVCS)*

One patient took the pain relief '*before I left the building'* (P9, 66, F) before the local anaesthetic wore off which she found was beneficial.

Paradoxically with the pain relief, the pain was eliminated but other areas of one's life were interfered with as a consequence. One patient felt with regards to the pain relief *'I was flying but I can't work with that'* (P3, 57, M)

Patients were able to eat but avoided eating on the side the implants were placed.

'*No no I was able to eat straight after, I wouldn't eat on that side, avoid it and I wanted nothing going into it*' (P4, 64, M).

Patients had to tailor their diet slightly, avoiding hard foods and *'cutting it up small'*

Patients were *'afraid if I have something sharp I might cut the gum'* (P17, 58, F).

Patients were surprised by the lack of pain they felt. They felt that they had overestimated how much pain they were going to feel post-operatively. Some patients felt *'Nothing. I wouldn't have thought anyone had even flicked the skin of my cheek. Zero I mean it was kind of incredible…I wouldn't have thought anything had been done or even touched in my mouth to be honest. No painkillers needed, bought them and never took them…. I skipped along no pain afterwards. Minimal discomfort during it. No more or probably less than a lot of dental work'* (P14, 55, M). *Patients just 'couldn't believe the ease of it all'* (P16, F, 68)

Again, patients were *'really surprised, I can't believe it really to be honest with you. I thought it was going to be so bad and it wasn't'* (P5, 67, F, IVCS)

For some patients the prescribed antibiotics 'a*ffects me quite badly I hate it so I just felt off- and that was the worst part. I was a bit sick and a bit sluggish'* (P16, F, 68). This was echoed a few times '*No as I said the only thing that I felt was the worst part was taking the antibiotic*' (P2, 30, F, IVCS). The same patient felt that you should be prescribed something to protect your stomach as well as the pain relief and antibiotics. The reason being *'you're not going to*

be eating like the first few days it is harder to eat so if you're going to be taking anti-inflammatories, pain killers and an antibiotic maybe even oxynorm…you're going to need something for your tummy, even just for the first 3 days' (P2, 30, F, IVCS).

Although the LA only group and the IVCS did not differ in their experience of post-operative pain. Some IVCS patients reported not being hungry that evening after the sedation.

'I wasn't hungry and I wasn't really hungry the next day because I was on a bit of a float you know' (P16, F, 68)

One patient felt that the sedation lasted well into the second day.

'Like you wouldn't be wanting to drive or anything ... I think that went into the second day alright before it really goes out of your body' (P5, 67, F, IVCS).

One patient discussed her coping mechanism to deal with the pain which was compartmentalisation. The same patient managed to avoid taking any pain relief using this technique. She believes that *'we have the ability to shut things off and that's why we often don't notice injuries or things going on because they're happening subconsciously. So I think once I park it down there at that level then it becomes what I would call 'manageable pain. It's going to be there but it doesn't really warrant much notice. It's like you've explained to yourself well I have this pain, it's not an unexplained pain, I know why it's there, what its coming from so then I just move along, get past it'* (P11, 45, F).

The only unexpected occurrence for patients was post-operative swelling
'The only surprise I got was I really didn't expect my face to be swollen. They felt that they had not been informed about swelling and *'For some reason I hadn't thought about swelling*

at all' (P12, 63, F) They felt '*DEFINITELY aware that I was after having work done'* (P2, 30, F, IVCS)

Patients felt '*kind of bruised' and 'a bit done in alright the first or second day'* (P5, 67, F, IVCS)

However, that being said, they appreciated that they *felt more swollen then what I actually looked'* (P2, 30, F, IVCS)

5.9.2 Post-operative instructions

The provision of post-operative advice and instructions, be in verbal or written, is part of the duty of care that is owed to any patient. Patients' need to know what is to be expected in the post-operative period and how they should manage oral hygiene and sutures as well as any pain, bleeding, swelling or infection.

There was a discrepancy regarding those who received written post-operative instructions and those that didn't '*No I didn't get anything'* (P10, 56, M). Some patients recalled verbal instructions such as *'rinse my mouth out with salt water'* (P4, 64, M) and '*just lick it with your tongue and just wash it like it was normal*' (P4, 64, M). Patients were told that '*the stiches were dissolvable'* but not advised to not use Fixodent with the while the sutures were in situ '*it clung to them so if I was taking out the denture it pulled on them'* (P12, 63, F). Many patients *'got no literature or anything' (P7, 63, F)*

One patient believed that she should have received a card with post-operative instructions of do's and don'ts.

'*That's one thing I was going to say. You know when I go to the dentist and every time I get a tooth pulled, they still give me a little card of the dos and don'ts of aftercare you know. And that would have been very handy* (P2, 30, F)

There is a difficulty in assimilating post-operative instructions before the procedure because patients are distracted by thoughts of the surgery at the time of information provision. Patients are focused on the surgery itself and disregard the details of the healing period.

'when you're about to have treatment it is hard to take stuff in. So that's why a piece of paper or a card to say how to look after them would have been beneficial' (P2, 30, F, IVCS)

5.9.3 Follow up

The follow up period includes any further correspondence with the dental hospital or the operating surgeon once the procedure was complete. This can include any further appointments of phone calls to the patient.

There was a perceived lack of follow up once the procedure was complete '*There was no aftercare. Once I left the surgery there was no aftercare, I had to look after me'* (P18, 74, M, IVCS)

There was a strong suggestion that communication with clinical personnel, for example the clinics nurse, would have be the best way of providing reassurance. He believed that he should have received a follow up phone call the next day

'*Even if it's just for psychological reasons. It would make you feel better. In my case I would have appreciated a call,* or *'if there was a helpline given on the day of the surgery that the patient could make contact with somebody, if there was an issue'* (P18, 74, M, IVCS).

With regards to working the next day, patient felt *'You could do with a day off really* 'but that it '*depends on what you work at'* (P7, 63, F).

In relation to the follow up appointment, one patient reported not remembering making her

appointment due to amnesia from the sedation. She only realised it when she found the appointment card in her coat pocket

'I have no recollection of making or anyone giving me the card' (P17, 58, F, IVCS).

There were no complications reported from the dental implant surgery. However, there were 2 cases of postoperative numbness associated with the bone graft procedure. One patient was able to manage this but another patient found it hugely debilitating *'It's like a lump of jelly at the side of my mouth... I notice that when it gets cold it kind of freezes'.* She felt she had not been informed about it as a risk and would not have gone ahead with the procedure if she had known about this potential outcome.

5.9.4 Repeating the experience.

This theme discusses if patients would repeat the procedure if they needed another implant or if patients would recommend dental implants. Overall patients had very positive responses when it came to repeating the procedure 'If I have to have another one I will' (P9, 6d, F) and hoped that '*at the end though it will be worth it 100%*' (P8, 19, F).

However, because they had only experienced the dental implant surgery and not dental implant restoration, they did not feel that they were in a position to definitely recommend them *'I suppose I can't answer that until the end... But I would imagine yes. If I'll be able to chew properly on that side again and get some sort of confidence back I would imagine so yes'* (P1, 24, F, IVCS).

When asked if they would recommend sedation, the majority of patients highlighted that they would recommend it for others if they were asked *'Highly, highly, I've been recommending it since'* (P17, 58, F, IVCS).

Patients felt that sedation helped them to overcome their anxiety and fear of surgical difficulties. Furthermore, it helped them to manage the duration of surgery *'I definitely would because it makes you more relaxed and it was all done so fast'*. (P5, 67, F)

One patient who wasn't offered sedation felt that if she was, she would have taken it

'*Oh yeah I think that's something that is needed, for me anyway. Yeah I would love it'* (P8, 19, F)

When patients who had sedation were asked if they could have done the procedure without sedation, there was a general agreement that no they wouldn't want to '*No I don't think so. I mean I could have tried, I'm brave enough to try but I think the pain would have been too much'* (P18, 74, M, IVCS).

6.0 Discussion

A traditional reliance on quantitative research and approaches in dentistry has left gaps in assessing the overall patient experience, particularly in relation to dental implant procedures. This study has qualitatively explored patients' experiences of the dental implant journey, namely the surgical stage, with or without IVCS. As far as the lead investigator is aware, this is the first qualitative research ever to be conducted on dental implants in Ireland. Given the rising trend of this procedure, over the past decade in Ireland specifically, it warrants appropriate study to ensure alignment of patient experience and clinical outputs. Internationally, it is the first qualitative research which addresses the experience of receiving dental implants under IVCS specifically. If IVCS is to become embedded as a preferable option for dental implants, we need to ensure that more research from a patient's perspective is undertaken to refine our patient approach.

As outlined previously, the aim of qualitative research is not to develop statistically significant and generalisable outcomes, but instead, to develop theoretical insights that could be transferable to other similar situations. Qualitative research has the benefit of being able to be adapted to be more patient centric – addressing those 'difficult to answer' questions which could not always be adequately addressed by quantitative methodology. This can provide insight into treatment choices and allow us to feedback into the patient experience cycle with a view of continuous improvement.

This research offers clinicians a deeper understanding of the patients' experience of dental implant surgery, their preferences, motivations, needs and values, as well as the adjunctive effects of IVCS. Moreover, this research offers insights to improve clinical communications based on the patients' views and suggestions and ultimately enhancing the quality of patient care.

The following discussion will bring together findings in order to summarise and understand patients' viewpoints on implant provision in Cork University Dental School and Hospital. It also identifies aspects of the patients' treatment journey, at which findings, could contribute towards improving their current experience and care.

Greater understanding of patients' experiences is invaluable for informing clinicians as to how the various stages of dental implant treatment affect the patient. Clarifying any issues is advantageous to identify aspects of care which are problematic and could be improved upon. This will further enhance effective communications between health providers and patients in the future. In implementing that understanding, the management of patients' expectations are amplified and concomitantly patients' concerns are reduced.

6.1 Discussion of Methodology

6.1.1 Participant Interviews

The initial protocol for the study involved a mixed methods approach for data collection, including both focus groups as well as face-to-face interviews. Focus groups are defined as carefully planned group discussions that are guided, monitored and recorded by a moderator, with the aim of generating information on collective views and the influences behind these views [147]. The focus group participants share their views and experiences about a certain topic, with the intention that these interactions will result in a greater depth of dialogue and data. Having said this, some participants may find a focus group intimidating and they may feel under pressure to agree with dominant personalities or socially acceptable views, which can result in generic data.

As evident from the results of this study, this patient cohort had a significant number of appointments and the logistics of organising a time and setting for a focus group that would be convenient for all participants was infeasible. It was also felt that for the same reason,

telephone interviews which would be audio-recorded, would be most convenient for patients and may result in a greater uptake of participants. It later transpired that due to the Covid-19 pandemic these interviews would have proved to be even more challenging to conduct, not least because of undue risk and alien personal protective equipment (PPE) donning and doffing.

There are many advantages to carrying out interviews over the phone. First and foremost, it is more convenient, safe and less time consuming for both the participants and the interviewer. It requires no travelling on either account thereby eliminating travel or car parking expenses. Furthermore, interviews can be arranged at a time that is suitable for both parties and participants can be interviewed from the comfort and privacy of their own home. This ensures a more relaxed informal environment, as opposed to the often intimidating clinical environment of a hospital setting. The lack of clinical time constraints meant that participants were more likely to speak freely and disclose sensitive information. Discussing sensitive topics over the phone may also eliminate embarrassment or awkwardness that might occur in person.

It is not surprising therefore, that due to this cost-effectiveness, time effectiveness and suitability when discussing sensitive topics that telephone interviews have become an increasingly attractive option amongst qualitative researchers.

However, there are some concerns about the effectiveness of telephone interviewing compared to face-to-face interviewing. Some researchers argue that the absence of visual cues via the telephone is thought to result in a loss of contextual and nonverbal data and to compromise rapport, probing and interpretation of responses [148]. During face-to-face interviews body language and cues from the interviewees can also add to the researchers

understanding [149]. Nevertheless researchers have argued that telephone interviews produced the same information as face-to-face interviews when compared during data analysis [142].

The face-to-face encounter is often seen as fundamental for the interviewer to build and maintain rapport with participants and thus enable the gathering of rich in-depth data. To overcome this, all patients were initially approached in person by the lead investigator at the implant consultation clinic. High quality data was also ensured by validating the responsiveness to the interview questions through active listening and clarification rehearsal. Active listening is where the interviewer waits several seconds after the interviewees have finished talking to keep interruption to a minim and to encourage further illustration of points [150]. Similarly, clarification rehearsal involves repeating points the interviewees have made to demonstrate understanding.

In order to facilitate an optimal environment for open disclosure without prejudice or recrimination, firstly gratitude was expressed to all interviewees followed by a statement of resolve, indicating the merit and import of their testimony in optimising the delivery of care to implant patients.

Confidentiality was carefully considered and the independence of the research from the patients' clinical care was made clear. This was to allow the participants to become comfortable in the interview and to express their viewpoint openly. It was made apparent to them that their account will not have any effect on their future relationship with their clinician or on their treatment outcome. That being said, there were definite instances where the lead investigator felt that patients were reluctant to speak disparagingly out of loyalty and respect for the operating surgeon.

Throughout the interviews, patients' often attempted to ask for clarification regarding doubts about the clinical pathways or the success of implants as a type of tooth replacement. On reflection, the lead investigator should have introduced themselves as a researcher as opposed to a clinician and when faced with these situations they should have reiterated their role as a researcher who has no link to the clinical team or the environment. They would then have been able to advise patients to discuss their concerns with the clinical team at their next appointment.

6.1.2 Purposive Sampling

Robust qualitative sampling demonstrates the diversity of study participants in order to produce data of sufficient depth and richness [138]. It does not intend to be statistically representative, nor does it aim to produce generalisable outcomes. Due to the heterogeneity of the population in terms of the extent of tooth loss and age of the participants, purposive sampling was used to facilitate the selection of the participants depending on the main study questions and linked to the thematic analysis and theme saturation. It is advised in the literature that between 6 and 10 interviews may be sufficient to reach data saturation when the research question is focused and the participants are less varied in their characteristics [140].

Although data saturation was achieved, over 70% of the participants were over 50 years of age with the majority being female. It would have been advantageous to have a greater age distribution and gender balance, as younger patients and males as a whole were under-represented. When considering the procedure, we may expect to have a fairly uneven distribution of ages, with older respondents potentially more likely to be seeking the

procedure due to retirement and more time to convalesce, length of time from initial tooth loss and other socio-economic factors. This is mirrored in the existing qualitative reviews explored in the literature review. It should be noted however, that the study population was dictated by referral, as per surgical candidacy, within a specified time frame – such that the variances outlined, while undesirable were unavoidable.

6.1.3 Analysis of Data

Due to the familiarity of the lead investigator with dental implant literature and the treatment journey, some thematic frameworks were anticipated, which shaped the research aims and objectives, interview questions and interpretation of data, as is often the case in thematic analysis. The findings were validated iteratively and used multiple observers (supervisors) to achieve analyst triangulation.

6.2 Discussion of Results

The following discussion will be categorised to follow the patient experience in chronological order according to pre-operative, intra-operative and post-operative timeframe domains.

6.2.1 Pre-operative

For the purposes of this discussion I will explore the most discursive themes that arose from the pre-operative timeframe domain. This was included the provision of implant information and addressing patients' information needs.

Dental implants are still a relatively novel type of tooth replacement, with a wide variation in the general public's knowledge and understanding of them [30]. This study's results highlighted how patients acquire unreliable information about dental implants which frequently lead to confusion regarding the dental implant process. Sources of information such as the internet,

media, friends and relatives impacted on patients' understanding and expectations of treatment outcomes. Patients clearly lacked information relative to their own specific situation.

An interesting finding was that the majority of patients tended to avoid doing online research for fear of unreliable sources and what they may read. The internet has increasingly become a well-known readily accessible source of health information for patients'. Studies have looked at the negative impact of the internet on patients' knowledge and experiences of disease and treatment [151, 152]

In Ireland, the Health Service Executive, has developed a patient information website which aims to present accurate health information on medicine and dentistry, about disease and management, in a way that the public can understand. This website does not however contain any information on dental implants. This is in contrast to the UK equivalent 'NHS Choices' which does contain some information on dental implants, albeit rather limited. That being said, the vast majority of online seekers (77%) will commence their search through well-known search engines like Google or Yahoo [151].

To investigate current information on implants and to explore the variability of the internet as a source of patients' information, a simple search was conducted via Google in February 2021 using the term 'dental implant' which revealed 104,000,000 results. The result of this 'first click search' showed very clearly that commercial and profitable webpages are prioritised over scientific groups or public funded webpages. The first 43 webpages were by private providers in Ireland offering implants followed by a Wikipedia page on the 44th webpage.

Further investigation needs to be conducted to assess the real impact of the readily available information on the internet on patients' thoughts and expectations. Patients should be advised to access specific websites that are trusted by clinicians and have no profitable background. Provision of well-informed pre-surgical information can minimize anxiety related pain during dental implant procedures [153].

This appears to tie in with the additional themes of dental tourism being considered a less preferable and riskier route for dental implants by our cohort. The respondents appeared to avoid internet searches of the procedure yet were definite in their assumption that going abroad for treatment would not have been considered. Again, this may relate to the age of the respondents in the study preferring perhaps not to travel in case issues arise.

While the dentist should be the first source of information, there were deficiencies in the information provided to patients, as echoed by previous studies [53]. There is therefore an associated need to engage with GDPs and enhance their roles in patient education about the implant treatment in view of the patients' individual needs.

With growing patients interest in implants for replacement of missing teeth, sound and correct knowledge and understanding should be established with patients with more reliance on clinical based sources of implant information. This may also help to mitigate any risks associated with poorly legislated dental activity abroad by ensuring that patients know the "how" as well as the "what". The respondents in the survey were able to articulate that they felt it was risky to travel abroad for treatment but did not expand broadly on rationale except that it was not for them. Enforcing pertinent knowledge, particularly in relation to the surgical steps involved in the implant journey, would help eliminate some patients' misunderstandings.

Interestingly, if you consider the destinations of qualitative studies carried out in the first section of the literature review, none of these are from countries which would be considered dental tourism destinations from an Irish perspective. This may be due to the search originally conducted using the keyword English but comparing such studies would be a useful cross comparison.

There is an upward trend in the number of legal claims arising relating to the placement and restoration of implants. Commonly, although not exclusively, these involve the development of peri-implantitis and implant failure [31]. The cases themselves can be complex and involve multiple clinicians, and the compensation claims associated with these cases are generally significantly higher than those relating to other areas of dentistry.

According to recent figures released by Dental Protection- the dental indemnity body for many countries- whose members are fairly consistent in terms of the proportion of legal claims which are implant related, account for between 8%-10% of all legal claims. There are slight variations between countries of course depending upon the proportion of clinicians involved in carrying out this treatment. The figures for Ireland and the U.K. fall into this bracket. Obviously, implants do not account for 8 – 10% of dental treatment so it seems fairly clear that implant treatment constitutes a disproportionately high litigation risk.

The issues identified in the letters of claim from solicitors often include allegations of failings with respect to the case assessment, treatment planning, the placement of the implant(s), the approach taken to restoration and occlusion and the maintenance of the implant. Claims are often complex and can relate to both the surgical phase and the restorative phase. The use of both fixed and removable prostheses can give rise to allegations and both are seen in legal claims. Treatment to address problems arising from implant dentistry often involve

significant costs and as a consequence legal claims in this area will generally be costlier to resolve than cases arising from most other areas of dentistry.

The issues most commonly arising tend to be around:

- Poor treatment planning – both in relation to implants and restorative options
- Inappropriate placement
- Consent, patient understanding and unrealistic patient expectations.
- Post-treatment complications and neuropathic pain

A significant risk comes from shortfalls in the initial case assessment and a failure to recognise potential obstacles to achieving a successful result from the outset. Added to this the comparatively high costs involved in implant treatment often contribute to patients being less willing to tolerate and accept less than ideal outcomes in terms of their own perceptions of what constitutes a successful result. It is not unknown for a technically successful result to still be associated with patient dissatisfaction as the outcome does not match the patient's expectation [32, 51, 52]. Patients' tend to have unrealistic expectations in relation to dental implants, particularly in relation to longevity of the restoration and the long term maintenance implications [31, 36]. Patients' acknowledgement of possible complications, maintenance needs and cost of repair are crucial. It is also fundamental to reinforce the discernment of dental implants from natural teeth in terms of care requirements [32].

Unsurprisingly, it can sometimes transpire that, in general terms, legal claims involving implant treatment can be marked out from those arising from other forms of treatment due to particular factors associated with dental implants specifically. First and foremost, when remedial treatment is required, the cost of this can be high and the inconvenience and upset

for the patient caused by repeated surgical procedures can be significant. There may be a need to remove and replace implants, carry out bone grafting and provide replacement restorations leading to inevitable delay and patient inconvenience.

Additionally, another factor can be the number of clinicians involved in the 'treatment chain'. A clinician involved in both placing and restoring implants is in control of the entire process of assessment, planning, placement and restoration. This individual clinician does however need to be equally proficient surgically and restoratively. If a clinician is not as skilled with one aspect of the treatment or another, the result is a negative outcome. When treatment involves two, or perhaps more, clinicians in providing the different phases of treatment this can allow each to concentrate on their specific area. Such arrangements can work very well but the inherent risk is that if there is an issue with the final outcome, it can be difficult to determine the proportion of responsibility which each should bear for the problem. For example, was the primary cause of failure the choice of implant location? Was the prosthesis success compromised by a less than ideal implant or was the implant compromised by the restoration? It is important to have strong teamwork to avoid issues in one area having implications on another part of the process. If a problem arises with 'multi-clinician' treatment it can be unclear where the fault lies. Claimant solicitors will of course seek opportunities to highlight any failings and exploit any sign of disagreements between clinicians. It is often the case that all of the clinicians involved will end up being parties in the legal claim, even if their part of the treatment was not in fact the main issue.

Another significant problem in terms of legal liability is the risk that treatment, even if otherwise successful, is associated with the triggering of neuropathic pain [154]. Chronic pain generates significant expense in legal claims. Nerve damage can obviously be caused by direct

trauma but pain can arise in circumstances where the cause is unclear. Whatever the mechanism which triggers neuropathic pain, such an outcome can arise in virtually any case, even with an experienced practitioner providing treatment with no obvious technical fault. The problem is simply that following treatment the patient develops persistent intractable pain of unknown cause however, as there is obviously some connection with the treatment, even if there appears to be no fault, claimant solicitors will seek to attach blame to the treating clinician and such cases can be expected to generate a significant claim for compensation, particularly if compounded by allegations of psychological effects. This may only arise in a small number of cases but legal cases involving chronic pain, and the more or less inevitable element of allegations of associated anxiety and allegations of 'adjustment disorder' or other 'psychiatric injury' can significantly inflate the level of compensation sought well beyond the costs associated with any dental procedures. In one of the first cases of negligence around consent in Ireland, Geoghegan v Harris (2000), the Plaintiff claimed that had he known of the risk of chronic neuropathic pain during dental implant surgery he would have foregone the treatment. The Judge held that a medical defendant was obliged to give a warning to the Plaintiff of any material risk according to what a reasonable patient would want disclosed and which is a known or foreseeable complication of an operation [155]. For this reason, it is important that a robust, and clearly documented, consent process which outlines the potential risks of treatment can be demonstrated.

Correct and tailored clinician delivered information is essential to ensure realistic expectations of the implant seeker. Clear information should begin with the GDP and this will enable better patients' preparation for the implant treatment pathway and eliminate patients' frustrations.

Difficulties in information provision are magnified by the restriction of clinical time, coupled with some patients' limited interest in gaining information.

Potential strategies for improving information provision include expanding the role of a dental care professional i.e. the dental nurse in relation to patients' education. This role would involve informing patients about dental implant surgery particularly in relation to the stages of implant treatment, oral and prosthesis hygiene and home care. The dental nurse could also act as a coordinator between the restorative dentist and the implant surgeon. The advantage of this is to ensure that important elements of care that clinicians many not have the time to perform are adequately addressed. The clinical needs will always take priority when under time constraints therefore we need to implement safeguards against losing this fundamentally important step of communication.

Participants welcomed a written information leaflet and felt that it contributed positively towards the enhancement of information. There were however discrepancies in whether or not the patient had actually received any hard document. On busy clinics where many roles are at play, it is easy to understand this omission. There must be strategies in place to ensure that this doesn't happen. One suggestion could be that the patient is emailed a copy of the patient information leaflet when they are scheduling their appointment for consultation or surgery. This will allow the patient to refer to the document in their own time and raise any questions they may have prior to the treatment. It could easily be incorporated into the booking process as an automated attachment, safeguarding against the clinician having to remember to pass the leaflet over. It is imperative that any advice is standardized as much as possible across dental settings to avoid discrepancies in information and ensure quality standards.

While a generic written leaflet can deliver basic information , their quality was questioned in recent research [156] and it was suggested that they need to be individualized to patients' needs, as informed by the implant surgeon. Written information tailored to consider patients of different ages, extent of tooth loss, stages of treatment and maintenance of implants should be considered. It would be inefficient to provide pre-scripted leaflets that allow for all combinations of circumstances but the development of computer programs or apps that would allow clinicians to select from a menu of options could be feasible [157]. This would further assist clinicians in timing the delivery of categorised information based on their topic of focus. Ultimately this would positively contribute to building accurate patient knowledge along the treatment pathway.

The decision making in this cohort of patients was very much based on the paternalistic approach, in which the treatment decision is dominated and leveraged by the clinicians' views. This is in contrast to the informed approach, when the patient leads the choice of treatment with passive clinical involvement. It would be ideal if patients and clinicians could strive for the shared decision making approach which builds upon the mutual participation of patient and clinician in discussion, with both parties sharing their information experiences, concepts and concerns regarding different types of management [158].

6.2.2 Intra-operatively

The themes that arose from the intra-operative timeframe domain included the patient-dentist relationship and the differences in experience between the IVCS and the LA group. The results from this study revealed that the majority of patients felt they had overestimated the unpleasantness of dental implant surgery. They trusted the operating surgeon and had positive sedation experiences. Overall their encounters of dental implant surgery were favourable, irrespective of IVCS, compared to earlier expectations.

The advantages of a good dentist-patient relationship for clinical practice are multiple. First and foremost, it facilitates a collaborative and trusting environment which ensures high quality care. Furthermore, it increases patients' interest in participating in any decision making and adhering to clinicians' instructions. Last but not least, it reduces patients dental fear and anxiety and facilitates a comfortable clinical environment [159].

It is claimed that the decision to have dental implants is influences by the clinicians' characteristics and level of expertise [160]. It has also been postulated that males and younger clinicians are likely to consider providing dental implants, over their older counterparts [161].

Patients were strongly motivated with regard to dental implant surgery and therefore accepted the relationship between surgery and pain as a necessary step towards an end goal. When patients hold high expectations of dental implants they may more readily accept the morbidity of the procedure [53].

The peak-end rule, first proposed by Daniel Kahneman, looks at how people judge an overall experience. It is postulated that people will base this judgement on how they felt at its peak (i.e. the most intense part) and at the end, rather than the average of every moment of the experience. This is true regardless of whether the experience was positive or negative. Evidence for this rule is apparent in the 1993 study entitled 'When More Pain is Preferred to Less: Adding a Better End' by Daniel Kahneman and Donald Redelmeier. Participants in this study were subjected to two different versions of a single unpleasant experience. The first trial had participants submerge a hand in 14 °C water for 60 seconds. The second trial had participants submerge the other hand in 14 °C water for 60 seconds, but then keep their hand submerged for an additional 30 seconds, during which the temperature was raised to 15 °C. Participants were then offered the option of which trial to repeat revealing that they were

more willing to repeat the second trial, despite a prolonged exposure to uncomfortable temperatures. Kahneman concluded that 'subjects chose the long trial simply because they liked the memory of it better than the alternative' [162].

The peak–end rule is particularly noteworthy with regard to medical procedures, since it suggests that patients' prefer to have longer procedures that include a period of decreased discomfort [163]. Most pertinently it suggests that 'the memory of a painful medical treatment is likely to be less aversive if relief from the pain is gradual than if relief is abrupt' [164]. Furthermore, the quality of a remembered procedure can drastically influence patients' decision making with regard to repeat procedures. However, factoring the effect of the peak–end rule upon evaluations of medical procedures is problematic and potentially unethical, since adding a period of decreasing pain to a procedure is still added pain. Although it results in a more positive memory outcome, the patient still endures more pain than is strictly necessary [164]. Kahneman claims that 'it is safe to assume that few patients will agree to expose themselves to pain for the sole purpose of improving a future memory'[162]. That being said however, clinicians can be mindful of the fact that the final moments of an encounter with a patient, are the moments which leave a lasting impression. It is imperative therefore that clinicians take the time at the end of the surgery to reassure patients, address any concerns and alleviate any anxieties that were felt intra-operatively.

It is worth emphasising that due to the amnesic effects of IVCS, this peak end rule, is less likely to apply to this group. Further, the sedated patients do not have as lucid a memory of the implant procedure to be able to alleviate any further fears around implant surgery, only that they believe IVCS improved the experience for them. In this way, any opportunity for acclimatisation has been removed. Parting reassurances will likely be forgotten and any last

positive impression this could have set. The IVCS group could approach future implant surgery, or even just further procedures associated with the implant, such as the restoration of it, with more apprehension due to the lack of any acclimatisation or experiential memory. It is not surprising therefore that patients are quoted as saying they couldn't have had the procedure without IVCS. In terms of application to future treatment planning therefore, these patients are more likely to requires IVCS for a similar procedure.

Positive experiences of sedation improved patients perception of the surgery by lessening their anxiety and minimising their perception of the duration of surgery which when elongated may adversely affect the patients experience [165]. Furthermore, the less aware, sedated patients can allow the implant surgeon to perform the procedure more effectively [48].

This research study did not aim to compare the IVCS versus the LA only group of patients as by their nature, they are not comparable. They were split into two groups for the purposes of analysis giving them a platform to capture their individual experiences and acknowledge the separate treatment pathways that lead to the shared destination.

The lead investigator was not looking for statistical differences based on shared outcome because the two groups were fundamentally different from the onset. The study design was not comparative. The lead investigator describes the differences in experience that can be captured, highlighting that differences do exist.

Although the amnesic effects of IVCS meant that this group did not recall much of the intra-operative period. The fact remains that this study was about the patients' recount of their experience, including amnesia. Therefore, it is not about what a clinician thinks their experience was, but what the patient actually felt about their experience.

Acknowledging the qualitative experiential individual difference, a patient on an implant journey may feel, presents this data in a digestible manner.

6.2.3 Post-operatively

It is generally accepted that following dental implant surgery, the majority of patients will experience mild to moderate pain and discomfort which interfere to some extent on their daily activities [166]. The average pain score is expected to be highest on the first day after surgery [167] with most patients feeling no pain 3 days after surgery [168]. The severity of postoperative pain is nonetheless subjective and can be related to a plethora of factors such as the complexity of the procedure, the number of dental implants placed, whether bone grafting was necessary as well as the patients' age, sex and socioeconomic status [53]. Patients in this study found the post-operative period completely manageable. These findings contrast with the findings of earlier studies which were associated with fever swelling and bruising [165]. The only reported difference in the post-operative period in the IVCS group over the LA only group was an increased desire to sleep after the surgery. This is due to the continued metabolism of the Midazolam.

Clear information on the expected level of pain post-operatively could improve patients understanding and acceptance of the pain. This also facilitates better communication and establishment of trust between clinicians and patients' [169]. Such clarity may help patients formulate realistic expectations and avoid misinterpretation which can frequently lead to dissatisfaction [52].

Approximately one in six adults in Ireland have significant literacy difficulties (central statistics Office, 2012) and simply providing a written instruction leaflet is obviously inadequate [170].

It is argued that patients tend to forget a considerable amount of information they are given prior to surgery and therefore it should be avoided [171]. Furthermore, facilitating communication with healthcare personnel namely the dental nurse, during the post-surgical period can assist in resolving patients' doubts.

The recent introduction of mobile apps for monitoring the quality of post-surgical patients' recovery at home has proved successful in other disciplines and may be on option for providing additional support [172]. Social media is another tool which has been suggested for communicating with patients but realistically where is the down time for clinicians? [173]

It is obvious from the patients' quotes that the enormity of their perception of the procedure was underestimated. There was a psychological need for follow up and reassurance. It appears that the quality of the follow up care effects their overall experience and their recovery feeling valued, more than would be anticipated. Further studies could explore the contribution of post-surgical communication with patients on their overall dental implant surgery experiences.

6.2.4 Anxiety

Dental implant insertion is one of the most stressful and anxiety provoking procedures in dentistry [88]. Although the procedure itself is rarely life threatening and has a relatively short recovery period, its physical and psychological impact make it a stressful experience. The causes of dental anxiety are complex and include behavioural, psychological and environmental factors which are amplified prior to surgery [89]. Furthermore, this anxiety is significantly associated with the patients' expectation of experiencing pain during the procedure.

Anxiety was a common subtheme throughout all stages of the implant journey. Patients were requested to complete an MDAS questionnaire concerning their anxiety pre-operatively. Not surprisingly, those who opted to have IVCS had higher dental anxiety scores. Pre-operatively patients' felt anxiety regarding the expectation of pain and treatment outcomes.

Intra-operatively those who had LA only were more likely to report sensory discomfort during the procedure than those who had IVCS. Post-operatively the lack of follow up or aftercare instructions was concerning for patients.

Patients with a high level of anxiety are more likely to report discomfort during surgical procedures [153]. As previously mentioned, pain is a complex sensory and emotional experience, closely associated with factors such as stress and anxiety. Generally, when anxiety exists, one is more perceptive of the painfulness of noxious events [90].

Anxiety and anticipation of pain may be the reason why patients do not choose to have dental implants placed [37].

Levels of dental anxiety are reported to stand between 3% and 20% of the population [76]. Dental anxiety can pose a significant barrier to dental care for patients, leading to avoidance and dental neglect. For a proportion of those suffering from dental anxiety, behavioural management techniques will help, but there will still be a large number who require pharmacological intervention to facilitate dental care. The use of conscious sedation in a general dental practice setting can increase the access to dental care for those with dental anxiety

Midazolam is the main drug used for conscious sedation technique[s] [129]. It offers the advantage of rapid onset, short duration of action, anxiolysis and amnesic effects. However it

carries the risk of respiratory depression, so whichever technique is used to administer it must 'carry a margin of safety wide enough to render the unintended loss of consciousness unlikely' (18).

6.3 Strengths

The strengths of this research include the rigor of the methodology and the contemporaneous interviewing that took place. Patients were interviewed seven days' post dental implant surgery which ensured the experience could be recounted and reduced the risk of recall bias. The overwhelming lack of pre-operative information and post-operative instructions highlighted areas which need to be improved upon. Compounding this, insight into ways in which we can improve the experience for patients namely expanding the role of the dental nurse and a post-operative phone call will ultimately lead to the optimization of patient care. By gaining in depth understanding of patients' thoughts and experiences, enhancement of clinical practice and patient care is possible. There was no intention to confirm or prove the success or limitations of the implant treatment and restoration.

6.4 Limitations

The findings on which this discussion are generated are from a qualitative study from one dental hospital in Ireland, which may not be transferable to another dental hospital. That being said, the aim of qualitative research is not to develop statistically significant and generalizable outcomes, but instead, to develop theoretical insights that could be transferable to other similar situations.

The limited time frame allocated to conduct this study limited the ability to fully explore the complete implant journey from tooth loss to restored prosthesis. It would be pertinent to follow a journey from start (tooth loss) to finish (restored implant) to get an idea of the overall

experience. This could be complimented by reissuing the MDAS and R-DBS questionnaires post treatment, with a view to ascertaining any changes to patient perceptions in relation to the dentist or their anxiety assessment.

Although anonymity of the patients was emphasized, there were definite instances where the lead investigator felt that patients were reluctant to speak disparagingly out of loyalty and respect for the operating surgeon. The influence of the operating surgeon also introduced some bias as not all patients were given the option of sedation. Furthermore, the sedated cohort reflections may have been skewed due to the medical effects of the sedation rather than the implant placement procedure itself.

As referred to earlier, although data saturation was achieved, the majority of respondents were female and 14 of the 18 respondents were aged over 50. The study population was dictated by referral, as per surgical candidacy, within a specified time frame – such that the variances outlined, whilst undesirable, were unavoidable.

The psychometric properties of the MDAS and the R-DBS questionnaires were not fully tested so it is difficult for us to know the sensitivity of this instrument picking up the necessary information.

7.0 Recommendations

Further study designs that extend longitudinally before and after dental implants to acquire a better awareness of patients' views, monitor patients' thoughts and anticipations of dental implant outcomes and recognize if any changes in expectation occurs during this time. This could be complemented by using the MDAS and R-DBS both before and again after the implant has been restored. As referred to earlier, an in-depth test into the psychometric

properties of both questionnaires (particularly given the R-DBS has not been used in an Irish study before) may help yield additional insights into how this tool could be rolled out more widely in Irish dental studies to refine our patient approach.

The use of the R-DBS could be extended to an entire practice's patient group, to include those not currently actively seeking dental care, to ascertain any insights in relation to their views on dental experience. It would be interesting to determine whether scoring correlates to the 'activeness' of patients regularly attending the dentist, since in this study the focus was entirely on those already engaged within the current treatment pathway of implant surgery.

Whilst this study explored some elements of dental tourism, it would be useful if a similar qualitative study of patients' experience of receiving dental implants (with or without IVCS) abroad was conducted. This would allow insight into any differences in the pre, intra and post-operative experience particularly in relation to the themes of anxiety, communication and patient information provision.

Additionally, further investigation needs to be conducted to assess the real impact of the readily available information on the internet on patients' thoughts and expectations.

Finally, there is little in the literature on the prevalence of neuropathic pain or altered sensation following dental implant treatment but it does feature in legal claims. Future studies should focus on this gap in the literature.

8.0 Conclusion

'Medicine is not only a science; it is also an art. It does not consist of compounding pills and plasters; it deals with the very process of life, which must be understood before they may be guided' Paracelsus (1493-1541)

Overall, the most pertinent message of this research is that patients' generally have a very positive experience of accepting dental implant surgery with or without IVCS. However, this appears to be delicately reliant on the patient practitioner relationship and certainly enhanced by good communication. It is obvious from the results how impactful operator rapport is. Patient confidence in and perception of operator skill set, approachableness and likability seem to be large players in how the patient goes onto view their overall experience, mitigating even against unfortunate side effects of the procedure in some cases. It is incumbent upon us as practitioners not to undervalue this.

Improving patient experience does not require the provision of unnecessary care, rather it necessitates an awareness of the ideas, concerns and expectations of any prospective patient. Optimal patient engagement therefore requires the clarity of communication which dictates any therapeutic aims discussed, be additionally buttressed by the physicians' knowledge of the experiential evidence base.

Appendices

Appendix 1 : Ethical Approval

COISTE EITICE UM THAIGHDE CLINICIÚIL
Clinical Research Ethics Committee of the Cork Teaching Hospitals

Tel: +353-21-4901901
Email: crec@ucc.ie

University College Cork
Lancaster Hall
6 Little Hanover Street
Cork
Ireland

CREC Review Reference Number: ECM 4 (p) 27/05/19

Date: 27th May 2019

Dr Richeal Ni Riordain
Consultant in Oral Medicine
Cork University Dental School and Hospital
Wilton
Cork

Study Title: Exploring patient experience of dental implant surgery with or without intravenous conscious sedation.

Approval is granted to carry out the above study at:

Cork University Dental School and Hospital.

The following documents have been approved:

Document	Approved	Version	Date
Cover Letter			
Application Form	Yes		13th May 2019 (received 14th May 2019)
CV for Chief Investigator	Yes		
Evidence of Insurance	Yes		
Study Protocol	Yes		
Data Collection Sheet			
Participant Information Leaflet	Yes		Add study title and investigator details prior to use
Consent Forms	Yes		
Study Questionnaire/Survey	Yes		
Interview Guide	Yes		

We note that the co-investigator(s) involved in this project will be:

Name	Occupation
Sinead O'Dwyer	Str in Oral Surgery.

Full ethical approval is granted to carry out the above study.

Please note that the above study must be carried out in accordance with GDPR.

Keep a copy of this signed approval letter in your study master file for audit purposes.

You should note that ethical approval will lapse if you do not adhere to the following conditions:

1. Submission of an Annual Progress Report/Annual Renewal Survey (due annually from the date of this approval letter)

2. Report unexpected adverse events, serious adverse events or any event that may affect ethical acceptability of the study

3. Submit any change to study documentation (minor or major) to CREC for review and approval. Amendments must be submitted on an amendment application form and revised study documents must clearly highlight the changes and contain a new version number and date. Amendments cannot be implemented without written approval from CREC.

4. Notify CREC of discontinuation of the study

5. Submit an End of Trial Declaration Form and Final Study Report/Study Synopsis when the study has been completed.

Yours sincerely

Professor David Kerins
Chairman
Clinical Research Ethics Committee
of the Cork Teaching Hospitals

The Clinical Research Ethics Committee of the Cork Teaching Hospitals, UCC, is a recognised Ethics Committee under Regulation 7 of the European Communities (Clinical Trials on Medicinal Products for Human Use) Regulations 2004, and is authorised by the Department of Health and Children to carry out the ethical review of clinical trials of investigational medicinal products. The Committee is fully compliant with the Regulations as they relate to Ethics Committees and the conditions and principles of Good Clinical Practice.

Appendix 2 : Patient Information Leaflet

Patient Information Leaflet

Cork University Dental School and Hospital-Oral Surgery Department

Dear _____

Thank you for agreeing to participate in our research.

The aim of our study is to learn about your experience of dental implant surgery with or without intravenous conscious sedation.

Dental implants have become an increasingly popular and fundamental option for the replacement of missing teeth. They are seen as the gold standard in treating a variety of patients ranging from single tooth loss to complete oral rehabilitation. In order to receive a dental implant one must undergo a surgical procedure.

Intravenous Conscious Sedation (IV Sed) is a technique that is designed to relax you during your dental implant surgery. In IV Sed, a sedative drug is used, and this is administered via a cannula that is placed in a vein either in the arm or the hand, for the duration of the procedure. This technique produces an altered state of consciousness, and relief of anxiety, enabling treatment to be undertaken. Whilst sedated, you will be drowsy, calm and vaguely aware of your surroundings. Should the dentist need to communicate verbal instructions to you, you will be able to hear them and respond appropriately.

The way in which we learn about patient experience is through interviews and focus groups (a group of between 5-8 people). This involves a face-to-face interview either on your own or with a group of people to talk about your overall experience. Alternatively, you may prefer to be interviewed via the telephone. It will not take more than an hour. All interviews will be anonymous. They will be audio recorded and transcribed into a written report.

All information will be dealt with in the strictest confidence. We hope to be able to use this research to improve your experience of receiving dental implants in our clinics.

Thank you for your participation and cooperation.

Yours sincerely,

Dr Sinéad O’ Dwyer

Appendix 3 : Consent Form

Consent Form

Section A

Participant Name _____

Title of the study

Exploring patients' experience of dental implant surgery and the adjunctive effects of intravenous conscious sedation

Dentist Directing Research: Dr Sinéad O' Dwyer

Phone: 021 4205012

You are being asked to participate in a research study. The dentists at University College Cork Dental School and Hospital want to know about your experience of dental implant surgery. They also want to know if having intravenous conscious sedation (if you had it) had any effect on this experience.

In order to decide whether or not you want to be a part of this research study, you should understand enough about its risks and benefits to make an informed judgement. This process is known as informed consent. This consent form gives detailed information about the research study, which will be discussed with you. Once you understand the study, you will be asked to sign this form if you wish to participate.

Section B

Nature and Duration of the Procedure

Should you agree to participate in the study you will be asked to to complete a face-to-face interview or participate in a focus group with an experienced interviewer. The questions you will be asked are in relation to your experience of dental implant(s) surgery. The interview/focus group process will not take more than an hour. All interviews will be anonymous. They will be audio recorded and transcribed into a written report.

Potential risks and benefits

We hope to be able to use this research to enhance patients' experience of receiving dental implants. We do not foresee any risks to patients during this study.

Possible alternatives

You may choose not to take part in this study. This will not affect your quality of care whilst receiving dental implants.

Section C

Agreement to consent

The research project has been fully explained to me. I have had the opportunity to ask questions concerning any and all aspects of the project involved. Confidentially of records concerning my involvement in this project will be maintained in an appropriate manner. When required by law, the records of this research may be reviewed by government agencies.

I understand that investigators have such insurance as is required by law in the event of injury resulting from this research.

I, the undersigned, hereby consent to participate as a subject in the above described project conducted at the Cork Teaching Hospitals. I have received a copy of this consent form for my records. I understand that if I have any questions concerning this research, I can contact the dentist listed above. If I have further queries concerning my rights in connection with the research, I can contact the Clinical Research Ethics Committee of the Cork Teaching Hospitals, Lancaster Hall, 6 Little Hanover Street, Cork.

After reading the entire consent form, if you have no further questions about giving consent, please sign where indicated.

I have read and understand the study: ☐

I agree to participate in this research: ☐

I grant permission for the data collected to be used in this research only: ☐

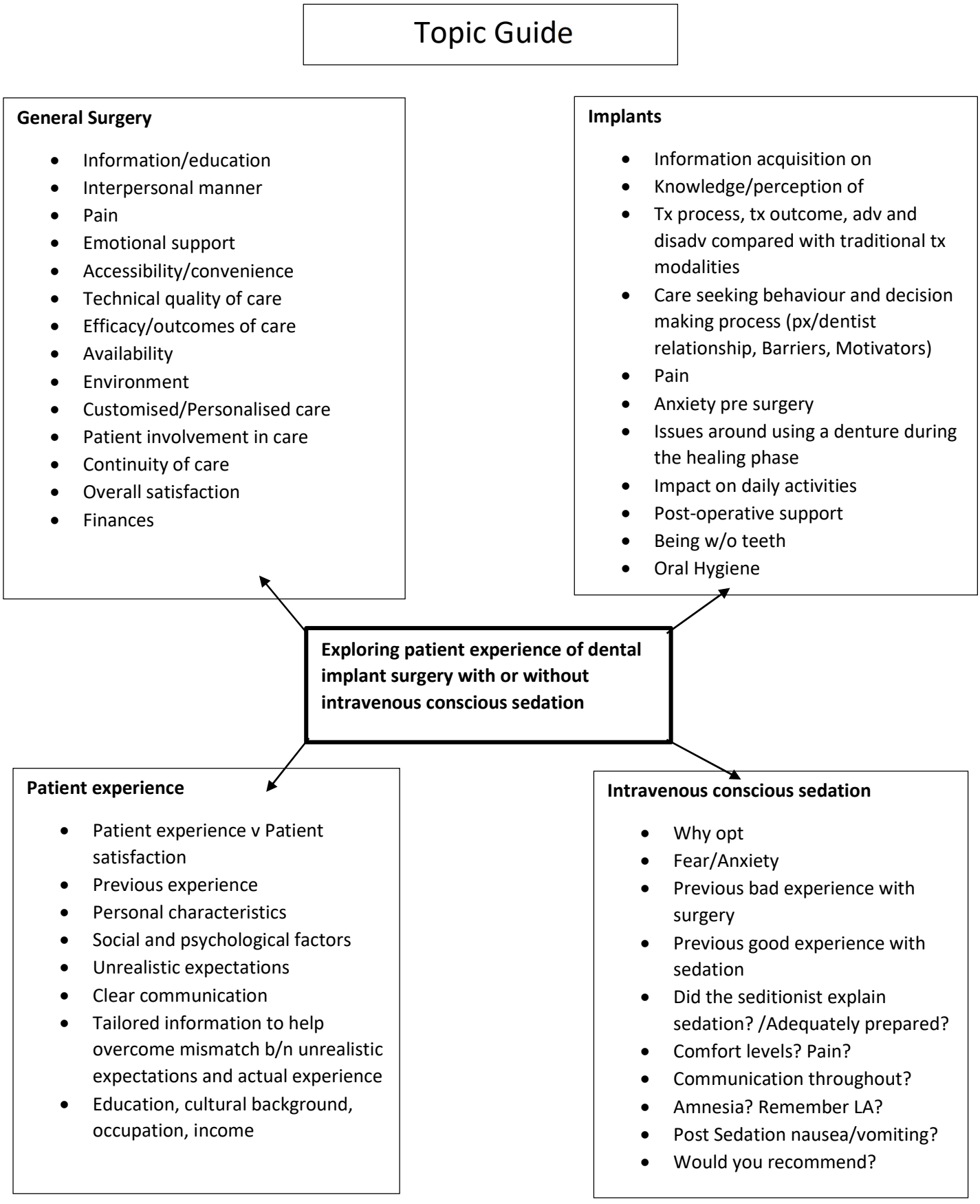
I agree to allow my interview to be audio-recorded: ☐

Chief Investigator Signature: _____

Signature of Study Participant: _____

Date: _____

Appendix 4 : Topic Guide Spider Diagram



Appendix 5: Topic Guide 1

Implants

-How did you lose your tooth and how were you referred?

-What do you think of the different treatment options for replacing missing teeth

-Did you know the difference between a dental implant and a bridge in terms of time, technique and cost?

-Where did you hear about dental implants?

-How do you handle medical knowledge? Do you want to know everything or nothing?

Patient Experience of Surgery

-**Before your surgery**

Were you given the right amount of information about dental implants?

What were your feelings when you first told about the surgical steps involved in placing an implant?

Did your surgeon spend enough time with you and encourage you to ask questions?

What questions did you ask?

Were your questions answered in a way you could understand?

-**During surgery**

What do you think of the surgical procedure for placing an implant?

Can you tell me about the overall impression you had on the day you had the implant placed?

Did you suffer any pain while having the dental implant placed?

In hindsight do you think that you were adequately prepared for the procedure?

On a scale of 1-10 what was your experience of the procedure (1 = 'never again' and 10 = excellent)

Did you feel uncomfortable at all?

-**After your surgery**

Did you have any pain after having the dental implant placed?

Did you experience any illness, swelling, difficulties to open the mouth, inability to go to work, difficulties conducting daily routines, difficulties talking, impact on taste, difficulties chewing, trouble sleeping or impact on social life due to implant surgery.

If you had a healing abutment placed, did you find it caused food impaction or annoyance?

Did anyone give you easy to understand instructions about what to expect/do during the recovery period?

Did the surgeon make sure that you were physically comfortable or had enough pain relief after you left the hospital?

Did you feel the surgeon spent enough time with you? /listened to you?

Did you feel the reception staff were as helpful as they should be and did they treat you with courtesy and respect?

How did you feel about wearing a denture or not having a tooth during the healing phase?

Intravenous conscious sedation

Why did you opt for conscious sedation?

Before you had your sedation did you receive printed documents on sedation?

Did the surgeon or seditionist explain sedation to you before the procedure? did you feel comfortable after this?

In hindsight do you think you were adequately prepared for sedation?

During sedation did you feel uncomfortable at all? any problems breathing? Feel cold? Experience pain?

Do you recall communication throughout the sedation? Do you recall the nature of this?

Do you remember the intravenous injection in your arm or hand? The local anaesthetic injection? The procedure itself?

Can you remember your journey home after the sedation?

Did you have any post sedation nausea, headache or vomiting?

Would you recommend intravenous conscious sedation?

Appendix 6 : Topic Guide 17

1) **The patient**

-Background anxiety linked to dental anxiety and coping mechanisms
-Did you ever lose confidence in your own dentist at any stage
-have you ever switched dentist?
-would you say you are a confident person? has losing a tooth affected this
-would you say you have a good diet?
-have you ever heard of periodontal disease?
-which is worse anxiety or pain?
-Do you smoke? Do you think this affects the implant?
-do you think that when you have time to think about something it makes you more anxious?
-would you trust someone more if they were more experienced or older or do you think it matters?
-what do you think of commercially drive dentistry?
-do you think if you lost a tooth more than 10 years ago that you could/would replace it?

2) **Implants**

-How did you lose your tooth and how were you referred?
-Do you feel you were to blame for losing the tooth or your dentist is?
Do you feel that losing teeth is associated with older age?
-What do you think of the different treatment options for replacing missing teeth
-Did you know the difference between a dental implant and a bridge in terms of time, technique and cost?
-Do you think it matters what tooth is missing? Or should we replace any lost tooth?
-What is your opinion on dentures, do you think it is acceptable to wear a denture these days?
-Where did you hear about dental implants?
Did you ever think about going abroad for your implant?
-How do you handle medical knowledge? Do you want to know everything or nothing?
-How would you prefer to access information? PIL, youtube, your dentist, the nurse or the specialist?
-what do you think of the cost of the implants
-What do you think are the barriers to implant treatment…cost or pain?
-Would you discuss something like this with your family or friends?
-Would you say that replacing the gap is just as important as feeling like you have a 'fuller' face? Aesthetic drive.
-If the surgeon pointed out another gap in your mouth that could also have an implant in it how would it make you feel?

3) **Patient Experience of Surgery**

-**Before your surgery**

Were you given the right amount of information about dental implants? In a way that you would understand?

What were your feelings when you first told about the surgical steps involved in placing an implant?

Did your surgeon spend enough time with you and encourage you to ask questions?

Do you feel that it is difficult to ask questions at the consultation appointment?

Did you feel involved in the decisions about your mouth?

Do you think it matters if the surgeon is relaxed? And do you think this comes with experience?

What questions did you ask?

Were your questions answered in a way you could understand?

-could you access the clinic easily? Car parking? Waiting room wait?

-**During surgery**

Did you have to wait long before being called for the surgery?

If the operator ran late do you think they should explain to you exactly why they ran late?

What do you think of the surgical procedure for placing an implant?

Can you tell me about the overall impression you had on the day you had the implant placed?

What was it specifically about the procedure that you didn't like? E.G the idea of the drill? Or blood? Or vibration?

Did you suffer any pain while having the dental implant placed? Is that what you expected?

Were you asked any questions while there were instruments in your mouth?

In hindsight do you think that you were adequately prepared for the procedure?

On a scale of 1-10 what was your experience of the procedure (1 = 'never again' and 10 = excellent)

Did you feel uncomfortable at all?

-**After your surgery**

Did you have any pain after having the dental implant placed?

If you were given pain killers that you couldn't work whilst taking, would you take them? Or would you choose to suffer in order to work?

Did someone tell you how the operation had gone?

Did you experience any illness, swelling, difficulties to open the mouth, inability to go to work, difficulties conducting daily routines, difficulties talking, impact on taste, difficulties chewing, trouble sleeping or impact on social life due to implant surgery.

Did someone tell you how the implant was going to look after the surgery, as in if you could see it or not?

If you had a healing abutment placed, did you find it caused food impaction or annoyance?

Did anyone give you easy to understand instructions about what to expect/do during the recovery period?
Do you know how to keep the implants clean?
Did the surgeon make sure that you were physically comfortable or had enough pain relief after you left the hospital?
Did you feel the surgeon spent enough time with you? /listened to you?
Did you feel the reception staff were as helpful as they should be and did they treat you with courtesy and respect?
How did you feel about wearing a denture or not having a tooth during the healing phase?
Do you think the benefits of having an implant done outweigh the risks?
Was there anything particularly good about your care? Was there anything that could have been improved?

4) **Intravenous conscious sedation**

Why did you opt for conscious sedation?
Before you had your sedation did you receive printed documents on sedation?
Did the surgeon or seditionist explain sedation to you before the procedure? did you feel comfortable after this?
In hindsight do you think you were adequately prepared for sedation?
During sedation did you feel uncomfortable at all? any problems breathing? Feel cold? Experience pain?
Do you recall communication throughout the sedation? Do you recall the nature of this?
Do you remember the intravenous injection in your arm or hand? The local anaesthetic injection? The procedure itself?
Can you remember your journey home after the sedation?
Do you think the amnesic effects of the sedation are good or bad? Would you prefer to remember the procedure?
Did you have any post sedation nausea, headache or vomiting?
Do you think sedation is similar to a GA if you've ever had one?
Would you recommend intravenous conscious sedation?

Modified Dental Anxiety Scale (MDAS)

CAN YOU TELL US HOW ANXIOUS YOU GET, IF AT ALL, WITH YOUR DENTAL VISIT?

PLEASE INDICATE BY INSERTING 'X' IN THE APPROPRIATE BOX

If you went to your Dentist for **TREATMENT TOMORROW**, how would you feel?

Not Anxious ☐ Slightly Anxious ☐ Fairly Anxious ☐ Very Anxious ☐ Extremely Anxious ☐

If you were sitting in the **WAITING ROOM** (waiting for treatment), how would you feel?

Not Anxious ☐ Slightly Anxious ☐ Fairly Anxious ☐ Very Anxious ☐ Extremely Anxious ☐

If you were about to have a **TOOTH DRILLED**, how would you feel?

Not Anxious ☐ Slightly Anxious ☐ Fairly Anxious ☐ Very Anxious ☐ Extremely Anxious ☐

If you were to have your **TEETH SCALED AND POLISHED**, how would you feel?

Not Anxious ☐ Slightly Anxious ☐ Fairly Anxious ☐ Very Anxious ☐ Extremely Anxious ☐

If you were to have a **LOCAL ANAESTHETIC INJECTION** in your gum, above an upper back tooth, how would you feel?

Not Anxious ☐ Slightly Anxious ☐ Fairly Anxious ☐ Very Anxious ☐ Extremely Anxious ☐

Appendix 8: The Revised Dental Belief Survey

The Revised Dental Beliefs Survey

The following statements, in this questionnaire, refer to various situations, feelings, and reactions related to dental work.

Please rate your feelings or beliefs regarding these statements by placing a circle around the number (1, 2, 3, 4 or 5) that most closely matches the feelings you have for dentistry in general.

1 = Never 2 = Once or twice 3 = A few times 4 = Frequently 5 = Almost always

1. I worry that dentists recommend treatments that are not really needed.

1 2 3 4 5

2. I believe that dentists do or say things to hide information.

1 2 3 4 5

3. I worry if the dentist is technically competent and if he is doing quality work.

1 2 3 4 5

4. I have had dentists who say one thing and do another.

1 2 3 4 5

5. I worry that the dentist will not provide me with all the information I need to make good decisions.

1 2 3 4 5

6. Dentists do not seem to care that patients need to rest sometimes.

1 2 3 4 5

7. I have had dentists seem reluctant to correct jobs that have not been satisfactory for me.

1 2 3 4 5

8. When a dentist seems anxious, I am worried that I am not receiving adequate care.

1 2 3 4 5

9. I worry that the dentist is not really looking for the best according to my interests.

1 2 3 4 5

10. Dentists focus heavily on finishing the job and not enough on patient comfort.

1 2 3 4 5

11. I worry that dentists do not have enough skill to handle my fears or dental problems.

1 2 3 4 5

12. I feel that dentists do not give clear explanations.

1 2 3 4 5

13. I worry that dentists do not like to take the time to really talk to the patient.

1 2 3 4 5

14. I feel uncomfortable asking questions.

1 2 3 4 5

15. Dental professionals say things to make me feel guilty about the way I take care of my teeth.

1 2 3 4 5

16. I am concerned that dentists do not take my concerns (fears) seriously towards dentistry.

1 2 3 4 5

17. I worry that dentists make me feel bad (don't take my fears seriously).

1 2 3 4 5

18. I worry that dentists don't like it when a patient makes a request.

1 2 3 4 5

19. I worry that the dental staff will embarrass me for the condition of my teeth.

1 2 3 4 5

20. I believe that dentists do not have enough empathy for what it really means to be a patient.

1 2 3 4 5

21. When I am in the dental chair I feel unable to stop the consultations to rest, if I feel the need.

1 2 3 4 5

22. Dentists seem not to notice that patients need to rest sometimes.

1 2 3 4 5

23. Once I am in the dental chair I feel helpless (because things are out of my control).

1 2 3 4 5

24. If I were to indicate that it hurts, I think the dentist will be reluctant to stop and try to correct the problem.

1 2 3 4 5

25. I have had dentists who do not believe me when I have said that I have felt pain.

1 2 3 4 5

26. Dentists often seem to be in a hurry, so I feel anxious.

1 2 3 4 5

27. I worry that the dentist does what he wants and doesn't really listen to me when I'm in the chair.

1 2 3 4 5

28. Feeling overwhelmed by the amount of work I need (all the bad news) is enough to avoid treatment.

1 2 3 4 5

Appendix 9: Irish Journal of Medical Science Publication

Irish Journal of Medical Science (1971 -)
https://doi.org/10.1007/s11845-020-02327-y

REVIEW ARTICLE

The patient experience of dental implant surgery: a literature review of pertinent qualitative studies

Sinéad O' Dwyer[1] · Richeal Ni Riordain[2,3]

Received: 5 June 2020 / Accepted: 23 July 2020

Abstract
This review aims to identify and summarise the findings of published qualitative studies relating to patients' experiences of dental implant surgery, by means of textual narrative synthesis. A comprehensive two-stage electronic and manual search of the literature identified relevant qualitative studies up to January 2020. Included primary studies ($n = 15$) used qualitative research methods including interviews and focus groups to investigate patients' experiences of dental implant treatment. They looked at the experience of tooth loss, the decision making process, the pre-implant experience, motivating factors and barriers for treatment and the post-implant experience with the prosthesis. There is a deficiency in the exploration of the patients' intraoperative dental surgical experience and the adjunctive effects of conscious sedation. The included studies give considerable insight into patients' experiences of the dental implant journey, which in the main, had overall positive consensus. The limited information available regarding patients' experience of the intra operative dental implant surgery with or without conscious sedation warrants further investigation. This information is a fundamental step to understanding the patients' preferences, needs and values and ultimately enhancing the quality of patient care.

Keywords Dental implant surgery · Patients' experience · Qualitative research · Tooth loss

Introduction

Societies' demographic is changing and so must our consideration of patients' needs. The Central Statistics Office Ireland identified a 20% increase in those over 65 years within a 5 year period [1]. According to the Irish Longitudinal Study on Ageing (TILDA), one in six Irish adults aged 54 years and over have no natural teeth with most wearing dentures. Not surprisingly, over a quarter of those experience difficulties with activities such as eating, smiling or speaking. Furthermore, this cohort of adults report less active social participation, lower quality of life, increased depressive symptoms and increased loneliness compared with adults with all their own teeth [2]. Dentists may also be associated with a patient's transition to the edentulous state, and therefore, there may be a reluctance to attend for further guidance. In line with the biopsychosocial 'vicious spiral' concept (Fig. 1), Carlsson et al. demonstrate that poor oral health status is related to a low level of satisfaction with dental and facial appearance which is in turn related to general anxiety and depression [4]. Completing the vicious cycle, Bernson et al. revealed that those with high dental anxiety and accompanying general anxiety were more likely to demonstrate avoidance behaviours [5].

Accepting that the latter symptomology of psycho-social predominance may prompt consultation with their general practitioner rather than with their dentist, referral for edentulousness must form an essential part of the holistic intervention umbrella.

Having an insight into the experience of patients undergoing dental implant therapy may provide medical practitioners with sufficient information to aid in the restoration of oral function via onward referral to a dental practitioner.

When addressing edentulousness, one can consider traditional dental prostheses such as conventional complete dentures or implant retained prostheses such as overdentures. In a systematic review by Kutkut et al. comparing conventional

✉ Sinéad O' Dwyer
sinead.odwyer@ucc.ie

[1] University College Cork, Cork, Ireland
[2] Cork University Dental School and Hospital, Wilton, Cork T12 E8YV, Ireland
[3] University College London Eastman Dental Institute, London, UK

Published online: 27 July 2020

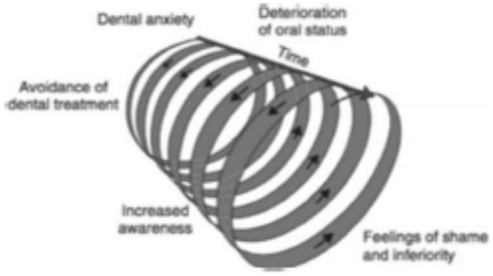


Fig. 1 Vicious spiral of dental anxiety, proposed by Hakeberg [3]

versus implant retained overdentures, the authors concluded that implant retained overdentures were associated with improved masticatory function, ability to speak, comfort and satisfaction [6].

The growing number of implants placed in Ireland reflects the evidence that patients' wish for 'a more sophisticated' approach to the management of missing teeth, often times with higher expectations [7]. Along with the desire for more complex care, they also wish to participate actively in the clinical decision-making. To allow this more active participation, then they need to be better informed of the patients' experience of dental implant surgery.

According to the British Dental Association, patients often present to their General Medical Practitioners for diagnosis, referral or treatment of dental issues. A knowledge of aspects of the patient experience undergoing dental implants will allow the discussion regarding dental implant therapy to commence in the medical setting with onward referral for dental consultation. Qualitative research explores the experience beliefs and expectations of patients undergoing dental implant therapy, reporting the patient experience in their own words. Traditionally, the systematic review of randomized controlled trials (RCTs) has formed the scientific basis of health care interventions. Qualitative researchers have suggested combining qualitative studies in a review to draw on the broader range of participants and descriptions [8]. Consolidating the body of knowledge on a particular topic will in turn enhance the significance of its findings. The aim of this review is to present a textual narrative synthesis of the patients' experiences of dental implant surgery.

Methods

Search strategy, qualitative data extraction and synthesis

A comprehensive literature search of the following databases, PubMed, Scopus, Web of Science, PsycINFO, Google Scholar and Cochrane, was carried out in April 2019 and updated in January 2020.

The search strategy for patient experience of dental implant surgery used the following MeSH terms and text words with the application of Boolean Logic: ((((((dental implant*) OR (dental implant surgery)) OR (dental implant prosth*)) OR (implant crown) AND (qualitative research methods)) OR (qualitative data analysis)) AND (patient experience*)) OR (patient based outcome*).

The search was limited to 'human', 'dentistry' and 'English language'.

A manual search was also carried out on the following journal titles, which were deemed especially relevant to the research topic:

- Clinical Oral Implants Research
- The International Journal of Oral and Maxillofacial Implants
- Journal of Dentistry
- British Dental Journal
- Journal of the Irish Dental Association

The second stage was then performed extracting the citations and reference list of all relevant articles to reveal any further relevant studies.

Studies were included if they used qualitative research methods and were published in English. Furthermore, they had to explicitly consider the surgical aspects of patients' experiences of dental implants.

The studies included for the qualitative synthesis were assessed for quality using the CASP checklist [9]; however, some studies will remain difficult to appraise and will rely largely on subjective judgement [10].

Analysis of included studies Categories for data extraction were identified and tabulated to compare across studies. Such categories included the type of implant restoration, the stage of the implant journey the patient was interviewed at, the method of data generation and the method of qualitative analysis. The authors' themes were identified, extracted and compared across studies. Lastly subthemes were highlighted which recognised commonalities across studies and any potential gaps in the literature (Table 1).

Results

The two stage search retrieved a total of 1442 papers. These were transferred to EndNote citation manager and duplicates were removed leaving 817 articles.

Title and abstract screening of 817 papers identified 45 articles that used qualitative methods to consider patients' experiences of dental treatment.

Table 1 Included qualitative studies concerning patients' experiences of dental implant treatment

Citation	Country	Patient demographics	Stage of treatment at which interviews took place	Data generation and analysis methods
Nogueira et al. (2018) [11]	Brazil	13 patients, $M = 4$, $F = 9$, age = 54–71 years	1 year post single implant mandibular overdenture	3 focus groups, thematic analysis
Kashbour et al.(2016) [12]	United Kingdom	34 patients, $M = 15$, $F = 19$, age = 16–76 years	Different stages if implant treatment	38 telephone and face-to-face interviews, thematic analysis
Abrahamsson et al. (2016) [13]	Sweden	15 patients, $M = 5$, $F = 10$, age = 27–87 years	Post-implant treatment suffering from peri-implantitis	Open-ended interviews, ground theory
Wang et al. (2015) [14]	Hong Kong	28 patients, $M = 10$, $F = 18$, age = 35–64 years	No involvement with implant treatment	6 focus groups, ground theory
Atieh et al. (2015) [15]	New-Zealand	15 patients, $M = 6$, $F = 9$, age = 36–77 years	Post-implant treatment	Interviews, inductive and content analysis
Exley et al. (2012) [16]	United Kingdom	27 patients, M:F ratio unclear, age = 23–84 years	Decision making stage of implant treatment	Interviews, thematic analysis
Rousseau et al. (2014) [17]	United Kingdom	39 patients, $M = 16$, $F = 23$, age = 23–84 years	Treatment or post-implant treatment stage	Semi-structured interviews, thematic analysis
Grey et al. (2013) [18]	United Kingdom	9 patients, $M = 3$, $F = 6$, age = 49–69 years	Treatment or post-implant treatment stage	Telephone interviews, thematic analysis
Lantto and Wardh (2013) [19]	Sweden	17 patients, $M = 7$, $F = 10$, age = 33–87 years	Post-implant treatment stage	Interviews, ground theory
Osman et al. (2012)[20]	New-Zealand	16 patients, $M = 13$, $F = 3$, age = 46–80 years	6 months post-implant treatment stage	In-depth interviews, ground theory
Nasby et al. (2012) [21]	Sweden	10 patients, $M = 4$, $F = 6$, age = 54–84 years	Post-implant treatment stage	Interviews, ground theory
Johansen et al. (2012) [22]	Sweden	17 patients, $M = 8$, $F = 9$, age = 46–81 years	3 years, post-implant treatment stage	In-depth interviews, thematic analysis
Ellis et al. (2011) [23]	United Kingdom/Canada	30 patients, $M = 13$, $F = 17$, age = 55–88 years	Refused to have a dental implant	5 focus groups, thematic analysis
Hyland et al. (2009) [24]	United Kingdom	33 patients, M:F ratio unclear, age = 48–84 years	Pre and post-implant treatment stage	Semi-structured interviews, thematic analysis
Trulsson et al. (2002) [25]	Sweden	18 patients, $M = 8$, $F = 10$, age = 58–86 years	Post-treatment with an implant retained denture	Interviews, ground theory

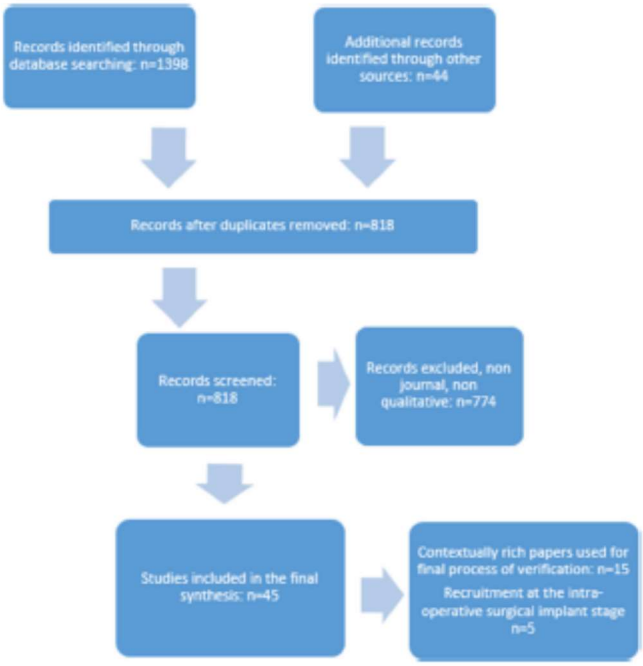


Fig. 2 PRISMA diagram of studies included in the qualitative synthesis, adapted from Moher D et al. (2009) [26]

Of these 45 articles, 15 articles considered patients' experience of dental implant treatment of which 5 recruited patients at the intra-operative surgical implant stage, as shown by the PRISMA flow diagram (Fig. 2).

The majority of the studies were conducted in the post implant stage with only two studies looking at the surgical treatment stage specifically [11, 12]. One study looked 3 years retrospectively after having an implant placed [22]. Another study interviewed members of the public who had no dental implant experience yet aimed to evaluate their information acquisition and perception of dental implants [14]. A recent study considered patients' experiences of dental implant complications, exploring their reactions on being diagnosed with such complications which unexpectedly may arise [13].

Ten of these studies based the 'implant experience' on retrospective accounts of patients either at the end of their treatment or after a period of using the implant retained restoration, be it a crown or a denture, with the main focus being implant restoration outcomes.

Only five studies recruited patients at the intra-operative surgical implant stage [11, 12, 16–18] and of these five studies, only two studies aimed to explore patients' thoughts, feelings about and experience of implant surgery specifically [11, 12].

Demographics included both sexes with a 23–86 year age range. The focus of studies was primarily on the denture-wearing population and their experience of implant retained dentures. Unfortunately, some of the studies failed to report on the extent of tooth loss [15, 17, 22, 25], which is, for obvious reasons, fundamental to their experience.

Data generation consisted primarily of one to one interviews. That being said, three of the studies had focus groups [11, 14, 23] and a further two studies had telephone interviews [12, 18].

The preferred methods of qualitative analysis consisted of thematic analysis [11, 12, 14–18, 22–24] and constant comparative methods of grounded theory [13, 19–21, 25].

In order to group common themes together across all studies, it is necessary to subdivide the intra-operative surgical phase into

- Pre-surgical anticipations
- The actual surgical experience-intraoperative treatment stage
- The healing phase

Pre-surgical anticipations

Patients identified that they had overestimated the amount of pain they would experience during surgery leading to pre-surgical anxiety [12]. In order to quell this anxiety, they tended to avoid obtaining information

about the surgical procedure, bestowing their trust upon the clinician instead [12].

> 'I didn't want to know about the surgery, what happened and how the implants came about to eventually go into your mouth may be because I trusted them 100%. I could put my complete trust in them (the clinicians)'

That being said, when questioned about the amount of pre-surgical information they had received, in a way that they could understand, patients felt that an explanation from the clinician far exceeded that on an information leaflet [15].

> 'I had information given to me to read, um, probably more face-to-face may have been easier'.

Patients also questioned their fitness to tolerate the surgery and inquired about its appropriateness [23].

> 'Your bones are already brittle, because you are older, and you have a hole (from the implant insertion). It's like planting a nail in a dry board: it can split in two, it can break'

The majority of patients believed that the benefits of achieving the goal of improving form and function far outweighed any pain or discomfort suffered [12].

> 'If I have to go through some pain, I'll go through any pain whatsoever, right, to have, to be normal again, it doesn't frighten me the pain and surgery, and that, it's a means to and end'

However, most patients felt that the costs involved were extortionate and a major deterrent from having treatment [11].

> 'I thought I could never have something like a dental implant. I thought it was something available for rich people only'

In saying that, when finances were not the issue, a non-descript apprehension of the unknown and a conviction that implant surgery would be painful remained a common theme [15].

> 'I don't want it (implant), they could give it to me free and I'd still refuse, I'm too afraid of suffering. I've had enough suffering. To start with I have a very low tolerance level for pain, thank you very much. So I would worry about the pain caused by implantation'

The actual surgical experience-intraoperative treatment stage

On the whole, patients felt that whilst they were knowledgeable about the surgery, they over-estimated the difficulty of the surgery and the severity of pain experienced, which they attributed to the skills of the clinician [15].

> 'I thought it was a lot better than going to the normal dentist, I thought that there was a lot of care involved, it's like, I suppose like having a baby, you know you're going to have it and its fine but when you're actually having it you think I don't want this'

That being said, one study indicates that the dental surgery can cause more physical trauma that anticipated [20].

> 'Oh well, the surgery was quite um; yeah I think possibly, it was a bit more dramatic than I thought. Yeah I think I didn't quite realise exactly the amount of surgery that was involved, I just thought you know that they would make a small incision and plonk it in. I didn't expect them to open, yeah I didn't expect quite some major surgery and it was a wee bit of a shock'

Contrary to this, another study concluded that most patients overestimated the amount of pain associated with the dental implant surgery [12].

> 'Oh, I think I overestimated the surgery. Definitely a lot easier than what you would think it was'

In most cases, pain during the surgery did not appear to be an issue at all [11].

> 'Well, I thought it was a painful procedure. And then I was really surprised, because there's no pain. It's painless'
> 'I felt nothing! All of a sudden, the surgery was almost over... I don't know if it was because I wanted so badly to get my mouth fixed that honestly I felt nothing'

Patients who chose to be sedated for the implant surgery considered this beneficial, necessary and a considerable advantage [12].

> 'I had the sedation, just in the back of the hand, it wasn't like a (general) anaesthetic. I'm not sure what it was, what they use, but it was great; I loved it. It was a good time, I can't really remember the surgery itself, which is great, no pain, no trouble. But I was very relaxed it went actually very quickly'

The healing phase

Post-operatively, many patients realised that they had underestimated the morbidity associated with this aspect of surgery. They tended to focus on the actual surgery and not on what would happen after the surgery was complete [12].

> 'I expected it to be painful having it done but as it turned out it was a lot more painful afterwards'

> 'I couldn't believe the pain about an hour later. I, it was very very extreme in the jaw bone, you know. I called into the pharmacist for some painkillers and they didn't work anyways. But eventually it settled down and my implants have been very successful'

On the contrary, some patients considered that they had overestimated the negative aspects of the post-operative period and were positively surprised when they experienced a painless period, rapid healing and an absence of complications. They smoothly returned to their usual habits including eating normally immediately after surgery.

> 'I had no pain nor inflammation. No problem at all. Everything was normal. Many people complained about pain and so on but I didn't have that. After surgery, I got home and had my usual meal: rice and beans… I've never had any problems ever since. Thank goodness'

To add further weight to this perspective, another study considered the cohorts' experiences of one implant placement and healing as generally positive [15].

> 'I was absolutely impressed. I thought gee it is like being in a hospital really, you know it was high-tech, very professional. The staff on the day, the doctors and the colleagues who assisted in the surgery and even the nurses in the surgery you know they put me at ease, there was no discomfort… I was as numb as anything, there was no pain, I could see all the blood happening and things and going, this is fantastic I can't feel a thing…'

Equally, another study revealed that the post-surgical recovery exceeded the pre-surgical negative expectations [11].

> 'I thought it would take longer to heal, to get better and be free of pain. In the beginning, I felt some pain, of course, but it didn't last. My body took it very well. I didn't have any problem or anything unusual. I thought it would be more complicated. I thought the pain would last longer'

Discussion

Dental implants can be placed in either one-stage or two stage surgeries. The first phase involves the surgical procedure of implant placement into the jaw, and the second phase involves exposing the implant and placing the final abutment. These procedures are usually undertaken by an oral surgeon or a dentist who has further training in implant surgery. Although meta-analyses showed no statistically significant differences for prosthesis and implant failures between these surgeries, trends, especially in fully edentulous patients, favoured two-stage (submerged) implants [27]. The two-stage approach is favoured in Cork University Dental School and Hospital.

Once the surgery is complete, the implant is then restored with a prosthesis namely a crown or a denture. To examine how the literature addresses the patients' experience of dental implant treatment at various stages, it is prudent to divide the pathway into pre-implant stage, intra operative implant surgery or treatment stage and post-implant stage with a prosthesis. In an effort to group common themes from this review, the surgery or treatment stage was further subdivided into pre-surgical anticipations, the actual surgical experience and the healing phase.

The reasons for the discrepancies in the surgical experience can be down to a number of factors. These include the patient themselves and their co-morbidities or pain thresholds, the number and position of the implants being placed, the level of anaesthesia or sedation used and indubitably the operators' skill and experience.

Barriers for treatment included a lack of information, co-morbidities, previous unpleasant dental experience, distrust in the clinician, older age, cost and fear [11, 12, 23]. Dental anxiety was unsurprisingly a major deterrent [21, 28].

Motivators for treatment included determination to improve aesthetics, function and their social life [12]. Additional motivating factors included a sense of opportunity to reverse time and a dissatisfaction with their current state [11].

No study mentioned any bone grafting procedures with only one study highlighting the experience of the dental implant complication of peri-implantitis [13]. One study suggested that the reason for this could be down to the challenges and discomfort that patients can be experiencing during this period [20]. There was also a complete lack of emphasis on the importance of maintenance of dental implants.

Furthermore, most studies focused on implant retained dentures with very few looking at single implant crowns. It is not surprising therefore that in conjunction with this, there was a deficit in information about the experiences of younger patient groups.

The majority of studies were retrospective with patients having finished their implant treatment. Very few studies interviewed patients in active treatment at the time of

interview. This may have reduced the possibility of obtaining in-depth information due to the pitfalls associated with memory recall. The benefits of contemporaneous interviewing would eliminate the bias that may be imposed when the patient is finished treatment compared with how they perceived earlier treatment stages.

A substantial finding from this textual narrative synthesis of key qualitative studies was the overwhelming lack of reporting on patients' experiences of receiving dental implants under conscious sedation. It is difficult to advocate for the use of conscious sedation when there is little to no research on the patients' experience of it. It is therefore paramount that future work must focus on filling the void in this part of the literature. The one study that did enquire about the experience of sedation felt that it was extremely necessary, beneficial and something they would highly recommend. They felt that the sedation helped them overcome their anxiety and managed this throughout the entire length of the procedure [12].

Conclusion

The studies included in this textual narrative synthesis provide insight into patients' experiences of dental implants, spanning the therapeutic timeline. They looked at the experience of tooth loss, the pre-implant experience, motivating factors and barriers for treatment and post-implant experience with the prosthesis. Future work should focus on the identified gaps in the research knowledge namely investigating the intraoperative surgical experience and the effects that conscious sedation has on this experience.

Improving patient experience does not require the provision of unnecessary care rather it necessitates an awareness of the ideas, concerns and expectations of any prospective patient. Optimal patient engagement therefore requires the clarity of communication which dictates any therapeutic aims discussed, be additionally buttressed by the physicians' knowledge of the experiential evidence base.

The included studies give considerable insight into patients' experiences of the dental implant journey, which in the main, had overall positive consensus. However, there is always room for improvement.

Authors' contributions Dr. Sinéad O' Dwyer had the idea for the review article, performed the literature search and data analysis, and drafted the work. It was then critically revised by Dr. Richeal Ni Riordain.

Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

Ethics approval Not applicable.

Consent to participate Not applicable.

Consent for publication Not applicable.

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Appendix 10 : International Association of Dental Research Abstract

IADR Abstract Archives

Exploring Patients' Experience of Dental Implant Surgery With our Without Intravenous Conscious Sedation: a Qualitative Study

Objectives: Little qualitative evidence is available regarding the patients' experience of dental implant surgery and the influence of intravenous conscious sedation (IVCS) on the implant experience. The aim of this qualitative study was to explore patients' experience of dental implant surgery with or without IVCS with specific consideration given to understanding the patients' preferences, motivations, needs and values.
Methods: Purposive sampling was used to recruit patients from the Dental Surgery Unit of Cork University Dental School and Hospital. A trained facilitator convened the individual in-depth semi-structured interviews over the telephone 7 days' post-surgery. Interviews were manually transcribed and imported into a qualitative software tool (Nvivo). The data were then analysed using a thematic framework.
Results: Eighteen semi-structured telephone interviews were conducted; 8 patients had dental implants placed under IVCS, while 10 had dental implants placed with local anaesthetic (LA) only.
Thematic analysis revealed that emergent themes fitted appropriately with 3 different time points along the dental implant surgical journey (Pre-operative, Intra-operative and Post-operative experiences). Data and analysis were categorized, therefore, to follow the patients experience in chronological order. This facilitated narration of the patients accounts of the experience in an explicit way. Preoperative themes that emerged included the impact of tooth lost, financial influences on motivation and dental anxiety. Intraoperative themes included confidence in the operating surgeon, local anaesthetic injections, the dental implant drill and being sedated. While post-operative themes that emerged were pain, postoperative instructions and follow up.
Conclusions: This research offers clinicians deeper understandings of the patients' experience of dental implant surgery, their preferences, motivations, needs and values, as well as the adjunctive effects of IVCS. Moreover, this research offers ways to improve clinical communications based on the patients' views and suggestions and ultimately enhancing the quality of patient care.

Division:
Meeting: 2021 Irish Division Meeting (Virtual)
Location:
Year: 2021
Final Presentation ID:

Authors
- **O'dwyer, Sinead** (University College Cork , Cork , Ireland)
- Ni Riordain, Richeal (University College Cork , Cork , Ireland)

Financial Interest Disclosure: NONE

Appendix 11: Codebook-Phase 2-generating initial codes

Phase 2 - Generating Initial Codes (151 initial codes generated in phase 2)	Interviews Coded	Units of Meaning Coded	Phase 2 - Generating Initial Codes	Interviews Coded	Units of Meaning Coded
Accepting discomfort	1	1	Hygiene	1	2
Access to information	1	2	Implants	1	1
Formal	8	14	Bone Level	1	1
Dentist	6	14	Location in the mouth	1	1
Patient Information Leaflet	1	1	Osseointegration	1	1
Patient information video	0	0	Tissue Level	1	1
Informal	5	12	Incision into the gum	1	1
Celebrities	1	1	Infection	1	1
Friends and family	4	4	Injections	2	2
Google	3	3	Cannulation	3	4
You tube	5	5	LA injection	2	2
Aesthetic drivers	1	1	Intraoperative pain	3	3
Aesthetic dentistry	1	1	Intra-operative anxiety	1	1
Dermal fillers	1	1	Justification of cost of implants	2	3
Extra-oral augmentation	1	3	Final result important	2	2
Extra-oral changes	2	2	LA wearing off	2	2
Functionality	1	1	Lecturing patients	1	1
Gap	5	9	Likert scale rating of experience	3	3
Straight smile	1	1	Loyalty	1	1
White teeth	1	1	Lying	1	1
Age related treatment options	1	1	Maternal Relationship	1	1
Age appropriateness	3	5	Adoption	1	1
Bridge	4	4	Maternal Guilt	1	1
Denture	10	17	Medical knowledge	6	6
Antibiotics	3	5	Dentistry knowledge	2	9

Phase 2 - Generating Initial Codes (151 initial codes generated in phase 2)	Interviews Coded	Units of Meaning Coded	Phase 2 - Generating Initial Codes	Interviews Coded	Units of Meaning Coded
Awareness	1	1	Sinus Lift	1	3
Blame	2	2	Mobile Phone	1	1
Changing bad habits	1	1	Overwhelmed by amount of dental treatment	2	2
Confident demeanour of surgeon	4	6	Pain	5	13
Careful	1	1	Thoughts of pain being worse than the actual pain	1	1
Efficiency	1	1	Patient information leaflet	2	2
Ego	1	1	Periodontal disease	2	5
Experience	3	3	Postoperative instructions	6	8
Having confidence in the surgeon	3	3	Stitches	1	1
Jolly	1	1	Postoperative pain	8	12
knowledgeable	1	1	Postoperative bleeding	2	3
Conflicting mouth	1	1	Postoperative bruising	1	2
Coping mechanisms	1	1	Postoperative clenching	1	2
Crowns	3	5	Postoperative eating	3	3
Dental attendance	1	1	Postoperative maintenance	3	4
Dental knowledge	4	6	Postoperative mouth ulcers	1	1
Dental extraction	1	2	Postoperative numbness	2	3
Dental fear	1	1	Postoperative pain killers	3	4
Dental filling	1	1	Postoperative sleep	1	1
Dentist neglect	3	4	Postoperative swelling	1	2
Desire for results	1	2	Postoperative work	1	1
Diet	1	2	Pregnancy	1	4
Fizzy drinks	1	9	Children	1	2
Junk food	1	1	Pre-operative anxiety	6	13
Distraction throughout the procedure	1	1	Distraction	3	3
Effects of sedation	1	12	Fear of the unknown	4	4

Phase 2 - Generating Initial Codes (151 initial codes generated in phase 2)	Interviews Coded	Units of Meaning Coded	Phase 2 - Generating Initial Codes	Interviews Coded	Units of Meaning Coded
Amnesia	4	9	Waiting for the appointment	1	2
Calmness	1	1	Reason for the delay	1	1
Awareness	2	3	Preoperative information	4	7
Exceeding expectations	1	2	Racism	1	2
Inability to sleep	2	2	Referral pathway	1	1
Loss of appetite	1	1	Relationship with GDP	1	3
Needing an escort	1	1	Risk	4	5
Similarity to GA	3	3	Root canal treatment	2	2
Unconsciousness	2	2	Second stage surgery	1	1
Environment	0	0	Sedation knowledge	4	6
Intimidating	1	1	Alcohol wipes	1	1
Location	1	1	Intravenous sedation versus Gas	2	2
Parking	2	2	Sensation	3	12
Staff	3	3	Smoking	1	6
Waiting room	2	2	Socio-economic disadvantage	1	1
Expense of implants	9	13	Sound	1	4
Payment	1	1	Talking during the procedure	2	2
Failed implants	0	0	Teaching students	1	1
Negative experience	1	1	Time	1	7
Feeling victimised	2	3	Neglect	1	1
Functional Impact	2	4	Trauma	3	4
Good team	1	2	Trust in the clinician	3	7
Having to go between surgeon and restorative dentist	1	1	Visualising the procedure	1	1
Implant maintenance	0	0	Wisdom teeth	1	2
			X-ray	1	2

Appendix 12 : Codebook -Phase 3 – searching for themes

Phase 3 - Searching for Themes (17 categories of codes identified in phase 3)	Interviews Coded	Units of Meaning Coded
Access to information	18	69
Aesthetic drivers	10	23
Age related treatment options	14	34
Background anxiety	3	7
Cost of implants	15	28
Dental Tourism	14	29
Dentistry as a profession	10	23
Effects of sedation	9	48
Environment	13	21
Implant Surgeon	13	28
Implants	11	18
Injections	10	13
Intraoperative period	13	20
Postoperative Period	18	74
Pre-operative anxiety	16	33
Pre-operative period	6	6
Sedation knowledge	17	35

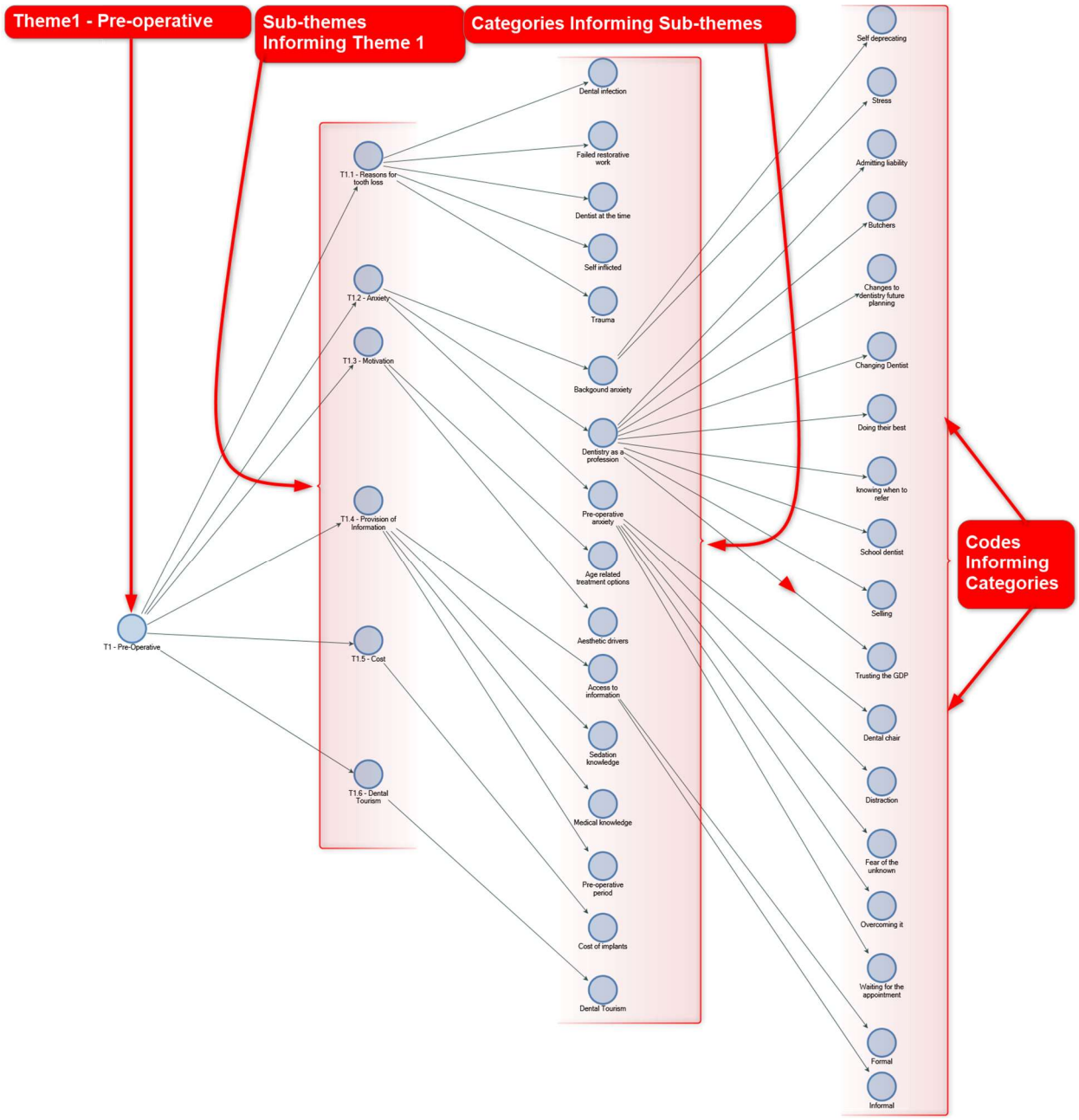
Appendix 13: Codebook –Phase 4 – reviewing themes

Phase 4 - Reviewing Themes (17 initial themes reduced to 14 at phase 4)	Interviews Coded	Units of Meaning Coded
Access to information	18	108
Aesthetic drivers	10	23
Age related treatment options	14	34
Background anxiety	3	7
Cost of implants	16	30
Dental Tourism	14	29
Effects of sedation	9	48
Environment	13	21
Implant Surgeon	13	28
Implants	11	18
Injections	10	13
Intraoperative period	13	20
Postoperative Period	18	74
Pre-operative period	6	6

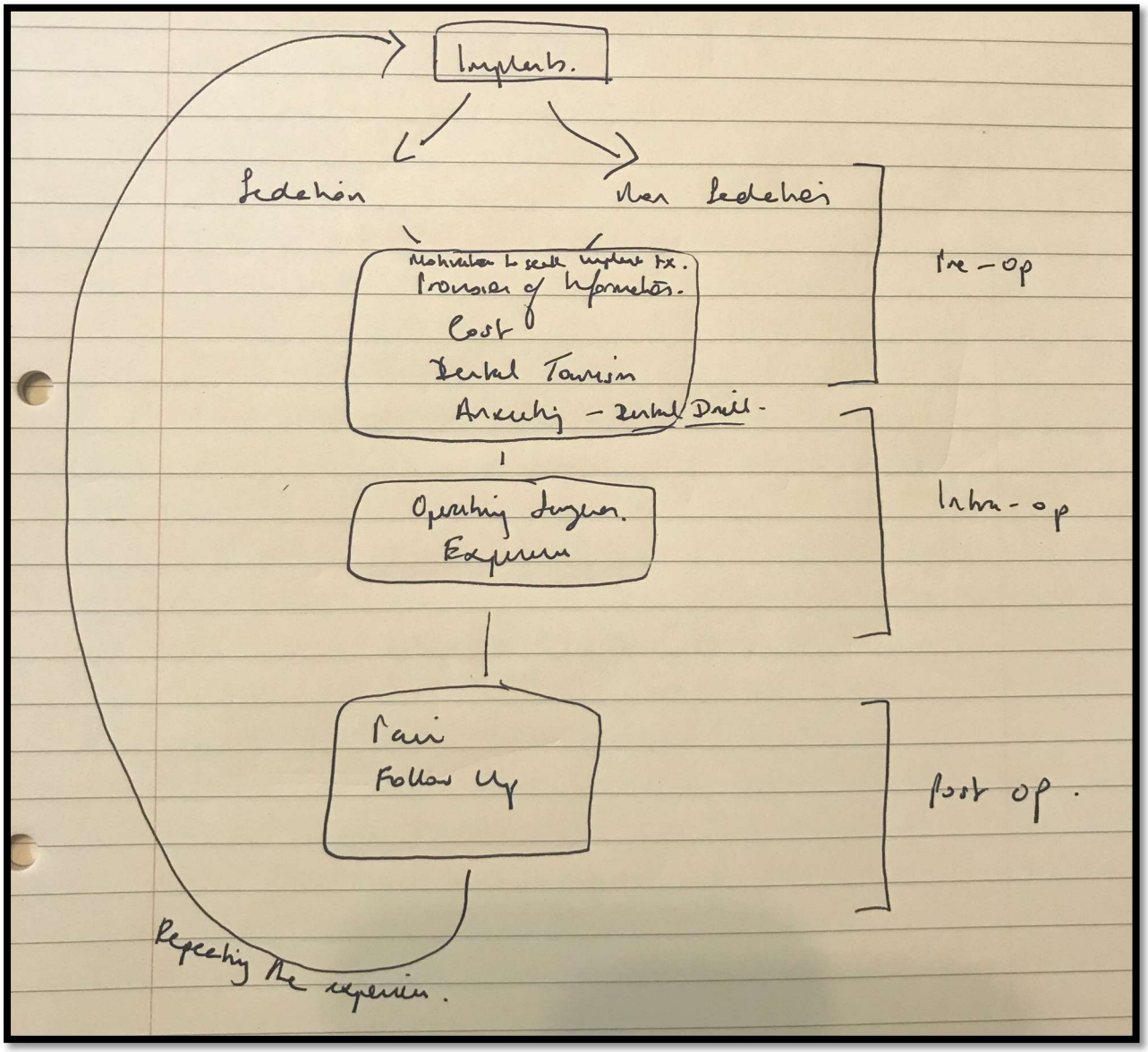
Appendix 14: Codebook-Phase 5-defining and naming themes

Phase 5 - Defining and Naming Themes (3 themes with sub-themes identified at phase 5	Interviews Coded	Units of Meaning Coded
T1 - Pre-Operative	**18**	**307**
T1.1 - Reasons for tooth loss	9	10
T1.2 - Anxiety	17	63
T1.3 - Motivation	15	57
T1.4 - Provision of Information	18	120
T1.5 - Cost	15	28
T1.6 - Dental Tourism	14	29
T2 - Intra-Operative	**18**	**132**
T2.1 - Operating Surgeon	13	29
T2.2 - Intra-operative anxiety	10	21
T2.3 - Cannulation	16	51
T2.4 - Effects of IVCS	17	103
T2.6 - Dental Implant Drill	14	32
T3.5 Local Anaesthetic Injection	14	27
T3 - Post-Operative	**18**	**75**
T3.1 - Pain	12	20
T3.2 - Post-operative Instructions	15	51
T3.3 - Follow up	2	4
T3.4 - Postoperative Anxiety	17	61
T3.5 - Repeating the experience	3	3

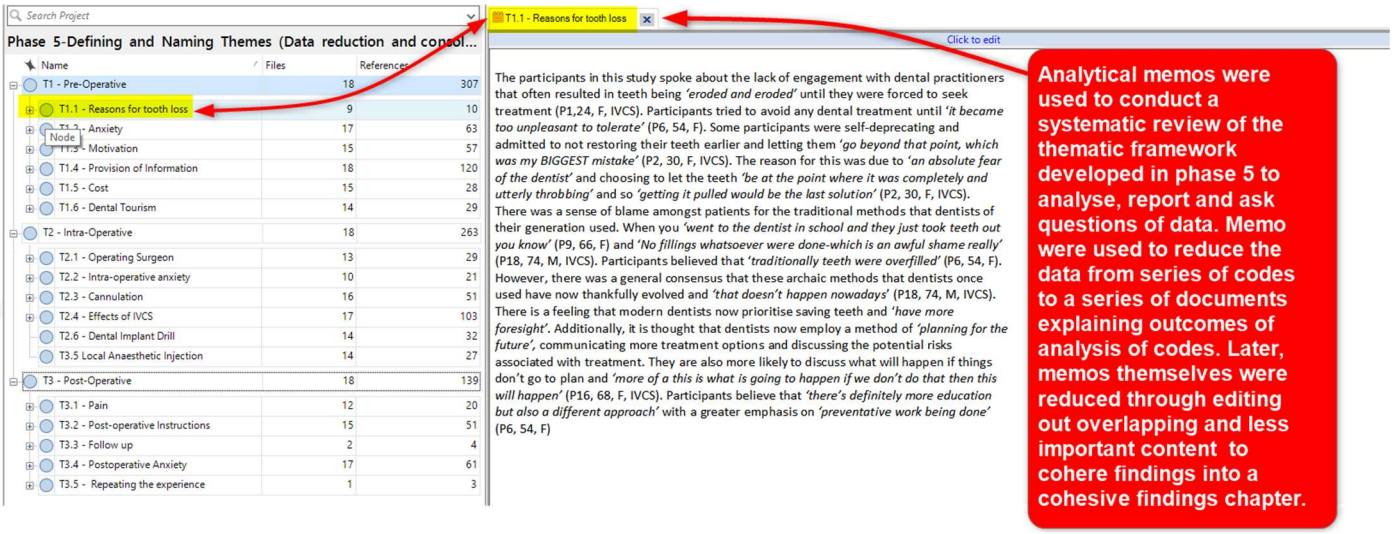
Appendix 15: Example of flow from codes to categories to themes



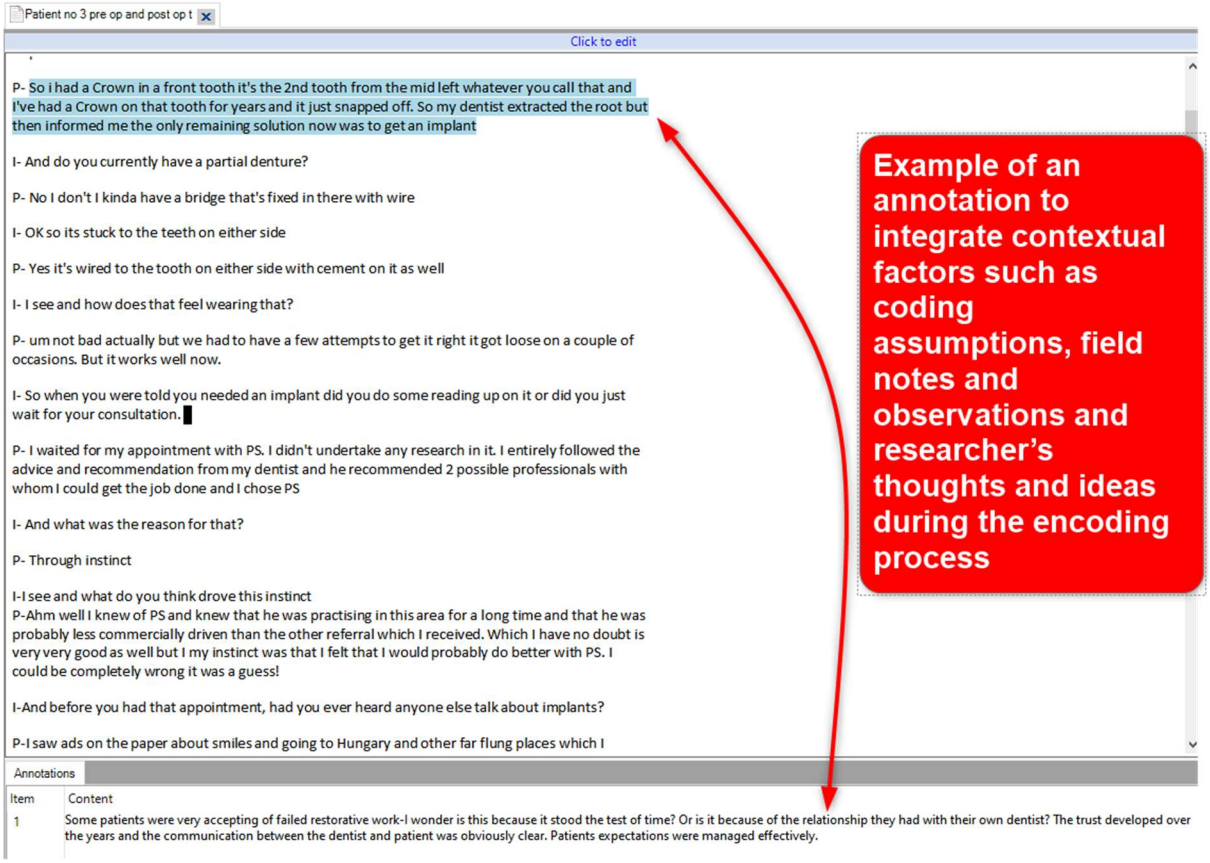
Appendix 16: Example of Conceptual Map



Appendix 17: Example of the role Analytical Memo



Appendix 18: Example of the role of Integrated Annotations



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